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Proceedings of the Workshop on Pedagogical Analysis in the Perspective of Modern Teaching Strategies in School Subjects

Held From 3rd October to 13th October, 2007

Sponsored By
Ministry of Human Resource Development, Govt. of India
& Higher Education Department,
Govt. of West Bengal.



Organised By

Institute of Advanced Studies in Education
David Hare Training College
25/3, Ballygunge Circular Road
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Dr. Kamal Krishna De, Ex. Principal DHTC-IASE
addressing the Opening Ceremony



A glimpse of the Workshop Participants and Resource Persons

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INSTITUTE OF ADVANCED STUDIES IN EDUCATION

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David Hare Training College
Institute of Advanced Studies in Education (IASE)
Workshop on : Pedagogical Analysis in the Perspective of Modern Teaching Strategies in School Subjects

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Dr. Subhas Chandra Bhat
Co-ordinator, IASE.

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  Prof. Partha Chattopadhyay (Music)

FOREWORD

Pedagogy has been defined as the art and science of teaching children. In the pedagogical model teacher has full responsibility for making decisions about what will be learned, how it will be learned, when it will be learned. Pedagogy helps to create a teaching-learning situation that actively promotes dependency on the instruction. Teacher educators who aspire to their readiness in teaching and assessment will be immensely benefited from the pedagogical analysis as it helps to determine the instructional processes. So an effort has been made by the IASE, David Hare Training College to organize a state level workshop on "Pedagogical Analysis in the Perspective of Modern School Subjects" during the period from 3rd October to 13th October, 2007 with a view to develop acceptable format of pedagogical analysis to promote the quality of classroom instructions. In this workshop the format developed by the University of Calcutta has been followed.

The nine day long IASE workshop was organized under the auspices of the Ministry of Human Resource Development, Govt. of India and the Department of Higher Education, Govt of W.B. More than 300 teacher educators of the 80 Teacher on Training Colleges covering all districts of West Bengal took part actively.

The workshop would not have been fruitful without the co-operation of the Programme Co-ordinators, Resource Persons, Participants and particularly Co-ordinator of the IASE.

I convey my heartiest thanks to all concerned for making the programme a grand success.

Dr. Pronab Krishna Choudhury
Principal

Report of the Co-ordinator of IASE -DHTC in the workshop titled– Preparation of Teaching Learning Module of school subjects in Secondary Level of W.B., based on Pedagogical Analysis held on 03.10.2007 to 13.10.2007 at David Hare Training College

Dr. Subhas Chandra Bhat, Co-ordinator of IASE-DHTC, WB.

It is very much known to all concerned that David Hare Training College is the only College in West Bengal that has been given a IASE (Institute of Advanced Studies in Education) status since 1998. Therefore the HRD. Govt. of India has given lot of important responsibilities to develop the quality of teacher educators through organising seminer, workshop and many other activities in different field of emergent issues of education viz. teacher training, curriculum analysis, developing Teaching-learning module etc.

After starting the whole-hearted activities in 10th plan and in centenary-year of the century old glorious and internationally famous primier Institution, David Hare Training College has organised an workshop on twelve different subjects at secondary and Higher Secondary curricular of West Bengal, for nine days in the month of October, 2007. The objective of this workshop was to dissipited & shared the idea of newly developed Teachers Training curriculum in Calcutta University to teacher educators of other Universities and the newly appointed teacher educators of the different Teachers Training Colleges of this University.

Therefore, a huge interactions and sharing of knowledge, and ideas were occured among the three hundread participants and resource persons attended the workshop from all the Universities and about eighty Teachers Training Colleges of West Bengal.

The successful workshop carries the product or output of its own. These five publications in different subject groups vig. Language, Social science group, Basic Science group, Education and Music bear the product of workshop with a tidious laboured of the programme-co-ordinators and participants and resource persons besides their regular duties. Hope, future progress will be held with assimilation of thinkings of all through the activities of IASE, cordial thanks to all the members of HRD, GOI. H.E. Dept, G.O. W.B., President and Secretary of W.B.B.S.E., Resource persons, Participants, Teaching, Non-teaching stafs of DHTC-IASE, Food suppliers, Photographars, Press, H.O. Dept. Education, Calcutta University and WBGCTA.

Preparation of Teaching–Learning Modules (TLM) Based on Pedagogical Analysis

B. C. Das (David Hare Training College, Kolkata)

It is generally agreed that to be optimally effective, institutional programmes should be tailored to individual students. All instructional programmes should capitalise on the usually high individual interests of students making use of strengths and promoting development in areas of academic weaknesses. The quality of an instructional system depends upon (i) the quality of presentation and display, (ii) the nature and extent of student participation and (iii) the accuracy of decisions regarding the assignment of the most appropriate learning activities for a student considering his/her needs, abilities, aspirations and motivation.

An effective educational system should try to individualise instruction. Individualised instruction, again, is function of the frequency with which the decision to change the instructional presentation is made as a result of pedagogical analysis of content based on the assessment of an individual student's achievements, needs or aspirations and motivation. Pedogogical analysis includes (i) Content analysis and structuring, (ii) specification of instructional objectives of each content elements, (iii) design and development of criterion–referenced tests based on specification table, (iv) strategies and methods of teaching including teaching aids and other materials, (v) identification of examples and non-examples, (vi) developing investigatory and probing questions and (vii) Critical summative evaluation of the topic.

A teaching-learning module (TLM) is a form of communication between the student and the content that contains instructions for student activities leading towards specified performance outcomes. A teaching-learning module is a structured sequence of learning events identified as a result of pedagogical analysis and designed to accommodate the attainment, on the part of the learners, of a range of objectives. The method and strategies for the preparation of teaching-learning module have some important in common. These include (i) individual pacing, (ii) feedback and (iii) reinforcement. The following points are to be emphasised for developing a teaching-learning module.

1. Consider the learner's interest.
2. Consider the learner's readiness.
3. Consider the learner's rate of learning (Time).
4. Consider the learner's repertoire of behaviours that he/she applies to learning.
5. Provide the learner with success experiences.
6. Provide the learner with corrective feedback.
7. Provide the learner with the knowledge of cognitive and psychomotor objectives.

Components of a Teaching–Learning Module (TLM)

1. Title : The title of the module should reflect the central theme or primary idea of the unit of work and the code number.
2. A Set of objectives; This is the most fundamental component for guiding and structuring the behaviour of the learner. These objectives should be behaviourally stated and should

specify the intent, performance conditions and the minimum acceptable standard of performance.

3. Rationale : A narrative statement for the student should be prepared. It should communicate to the learner the overall intent of the module and its importance or relevance to the student's course of study.

4. Overview : It is designed to refresh the learner, clarify vocabulary terms and establish a mental set for the learner who basically knows the material. For the learner who is unfamiliar with the content, the overview serves as a preview of that content.

5. Pretest : It is a self-assessment instrument to know whether the student possesses the prerequisite information for probable success with the module. It also determines whether or not the learner needs the coming instruction.

6. Self-Evaluation : The purpose of self-evaluation is to (i) allow the student to bypass the module, (ii) guide the student to those portions of the module that he needs to study and (iii) allow the student to check on his own progress level before the final evaluation.

7. Learning Activities and Instructional Alternatives : This is the heart of the module and is the core of the teaching–learning activities. Several alternative learning strategies are generally provided. The learner is to select one from many instructional options. The learning activities should provide each student with a choice of alternatives concerning not only how, what, when and where to learn, but also opportunities for the efficient use of widerange of learning resources e.g. multimedia, multimode, multicontent and multiactivities.

5. Special Student Directions : It depends upon the nature of the content to be presented or the organisation of the materials. It indicates the use of specialised equipment or facilities and the implications for time or scheduling of activities.

9. Resources : This section is designed to list and enable the learner to locate all the materials and media devices required to successfully complete the module.

10. General Classroom Management Procedures : It is necessary to state the location to which a student should submit completed papers or assignments or directions for finding certain types of resource materials and equipments.

11. Post Test : This is a criterion–referenced measure designed to require the learner to perform or demonstrate the behaviours as specifically stated in the objectives. The nature, length and conditions of the test will be dictated by the objectives.

12. Teachers Instructions : This section is essential for smooth presentation, management and evaluation of the system. Notes or suggestions to the teacher in terms of methodological approaches or strengths or other special instructions should be included and perhaps, a list of professional sources of information should be enclosed.

The Teaching–Learning Module (TLM) may be any length, usually requiring from about one-half-hour to 15 hours to complete. Some modules, when coupled with extended field experience activities, may require a number of weeks to complete.

PEDAGOGICAL ANALYSIS IN THE PERSPECTIVE OF MODERN TEACHING STRATEGIES IN SCHOOL SUBJECTS

SUBJECT–PHYSICAL-SCIENCE

Organised by—

INSTITUTE OF ADVANCED STUDIES IN EDUCATION (IASE)

DAVID HARE TRAINING COLLEGE

KOLKATA–700019

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3.	Dr. Mausumi Chatterjee	Fakir Chand College
4.	Khagendranath Chattopadhyay	Institute of Science Education– The University of Burdwan
5.	Kausik Chakrabarti	Govt. Training College–Hooghly
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8.	Partha Mitra	Institute of Education–Haldia Purba Medinipore
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Report of the Programme Cordinators of Physical Science

Dr. Subhas Chandra Bhat Co-ordinator of IASE-DHIC (WB.)

Congratulation to all those who participated in the work-shop of physical science both as participants and as resource persons. Our motto of the workshop was to develop teaching learning module of Physical Science in secondary level curiculum of West Bengal Board of Secondary Education, based on paedagogical analysis introduced in the Calcutta University, B.Ed. Curriculum. So, there is two parts, firstly–clear understanding of the concept of pedagogical analysis and Second developing teaching-learning module with the help of the previous concept. Initially three days workshop were assumed to complete the job totally. But it was impossible to complete such an task of the whole syllabus of Physical Science. Therefore we have developed some model examples of paedagogical analysis of different units in Physical Science.

Teaching-learning-modules as it was thought by the programme authority, could be framed by all concerned of a particular subunit following the instruction as proposed by Profesor Bimal Chandra Das, whose lecture is being attached with the publication printed matter. The programmed cordinator himself has developed such an TLM and attached here which may be developed by more interactions. Thanks to everyone.

This publication carries the Lectures of the resource persons, model example of pedagogical analysis of contents and concepts and a model teaching learning module based on pedagogical analysis.

PEDAGOGICAL ANALYSIS IN SCHOOL SCIENCE

Dr. Kamal Krishna De,
Ex-Principal, David Hare Training College, Kolkata

1.0. INTRODUCTION : Pedagogical Analysis (P.A) of any school subject, prima facie, means an analysis of teaching of the subject from the ***cognitive view point of learning.*** The term is relatively new and it has some glorious antecedents. P.A. is a tool for achieving **quality teacher's training** and so also for **quality education.** If teaching is divided into THREE successive stages (i.e. Pre active, Interactive, and Post active stages) P A may be essentially included in the 'Pre-active' stage. **Lesson plans** which also belong to the **pre-active stage** originate from this **P. A.**

2.0. ***Antecedents of P.A.*** : Along with lesson planning there is another planning, broader in perspective, called **UNIT PlAN** introduced in methodology of teaching in near about 1960. This unit plan may be treated as the predecessor of the modern P.A. A glimpse of the structure of unit plan is shown below for the better understanding of P.A.

TABLE–1
Analysis of Unit

Subject–Physical Science Class–IX Unit–Change of State
General Instructional Objectives (for the Unit)–(1) .... (2) .... (3) .... etc.

Sl. No.	Sub-Units (SU)	Concepts/Principles In the S.U.	Broad Methods	TLM	Time required
1	Change of states, its causes	Molecular arrangement, intermolecular force & distance, their changes due to heating	Lecture	Sample of different matter, Charts	2 periods each of 35 minutes
2					
3					
4					
Etc.					

TABLE–2

Lesson No.–1 **Lesson**–Change of states of matter & its causes

Learning Points	Behavioural Changes	Teacher' Activity	Students' activities	Evaluation
1 Molecular arrangement	Draws the arrangement Finds cause & effect relationship in the change of molecular arrangement	Teacher draws arrangement before & after heating on and gives lecture	Students draw on work-sheet	What is the effect of heat on the molecular arrangement?
2				
3				
4				
5 etc.				

The unit plan was included in the curriculum of B.Ed in Physical Science under Burdwan University before 1992 and a broad question was used to be set as an alternative of lesson plan.

2.1. The UNIT PLAN contains the following elements :

1. Selection of Unit.
2. Identification of General objectives for the unit.
3. Analyzing the unit into subunits.
4. Identifying the teaching points in each sub-unit.
5. Identifying the instructional objectives for each sub-unit.
6. Identifying the instructional objectives for all the learning points.
7. Identifying the teaching-learning materials for each sub-unit and each teaching point belonging to it.
8. Identifying the broad teaching method for each sub-unit.
9. Identifying teacher's/pupils' activities on each learning points.
10. Evaluation on entire Unit.

2.2.Limitation of unit plan :

1. It **does not state** the type of learning to be used (e.g. discrimination learning, concept learning, rule learning, problem solving learning etc.)
2. It does not reveal the connection between a particular concept with its supra ordinate or subordinate concepts (e.g. How heat is connected with superior concept like K.E/P.E and subordinate concepts like temperature, specific heat etc.)

3. It does not identify the salient characteristics/properties of a concept.
4. It does not emphasize previous experience of the students.
5. It does not provide ***adaptation*** technique of the students for processing any information.

It will be apparent from the subsequent discussions that pedagogical analysis can remove the major shortcomings of the UNIT PLAN.

3.0. Pedagogical Psychology and Pedagogical Analysis

"Pedagogic Psychology (PP) studies psychological aspects of teaching (***which studies regularities of* assimilation of knowledge, *skills and capabilities.***) and the upbringing. PP examines the psychological problems of purposeful forming of cognitive activity.....ensure an optimal teaching result...the relationships between teacher and students and also within the class." A Concise Psychological Dictionary, Progress Publishers, Moscow (1985).

ASSIMILATION, COGNITIVE ACTIVITY and REGULARITY can be incorporated in the P.A. and ***not*** in UNIT PLAN

3.1 Conceptual structure of Pedagogical Analysis.

"**Pedagogical** analysis of school teaching subjects has been thought of as an essential component of practice teaching . By way of pedagogical analysis, a student teacher becomes conversant with the **objectives of teaching a unit**, the **entry behaviour of pupils, classroom management** and the evaluation strategies. With this background of having looked into the pedagogical aspects of school teaching subjects, the student teacher is likely to become **more effective** and **confident in the classroom**"-Curriculum Framework for quality teachers" Education (1988) NCTE, Delhi.

3.2. THE DIVERSITY IN THE PEDAGOGICAL ANALYSIS

Different Universities of West Bengal follow different techniques in P A for Teaching Science, as for example.

Jadavpur University : It has introduced only content analysis of a unit in a sequential order with instructional objectives of the Unit.

Kalyani University : It has introduced Pedagogical Analysis of Concepts (no details of direction are given on the Question paper)

Calcutta University : It introduced PA of Units of Science subjects. The PA partially resembles the above noted Unit Plan.

Other Universities are known who have not introduced PA

The consensus as seen in the case of lesson planning is hardly seen in the case of PA in the curriculum of different universities. So we are on the crossroad so far as the PA is concerned.

What do we actually want- PA of unit or concept? It may stated in this connection that the unit means a hierarchy of concepts. At present, a chapter does not always represent a hierarchy of concepts . A topic or a chapter is very often a conglomeration of facts /concepts and not hierarchy of concepts. So now a **'chapter'** is not always **'unit'**.

3.3. Utility of Pedagogical Analysis :

1. In the UNIT PLAN *less emphasis* is given on how the students would **learn.** In **P A emphasis** is given on how the students would **learn.**
2. Pedagogical Analysis **does not aim at rote learning,** rather it emphasizes **Meaningful Learning , Discovery Learning, Problem Solving Learning.**
3. For above noted types of learning information is given to the students in such a fashion that they are able to **process** the information and **modify** their **Experience** or **Schema.** P A **incorporates** these techniques
4. The new learning will be well connected to the existing experience of the students if **examples, non examples analogies, abstraction, generalization, transfer of learning are suitably regulated.** Practically this is done in P A.
5. **Advance organizer, Probing questions** (based on information, experience & **reasoning**) help to assimilate the new learning.
6. In P A the student teachers must **not violate** the intention of the curriculum but they should see that the P A is helpful to **themselves, to the evaluators, text book writers, future curricular planners and teaching aid designers.**
7. While framing lesson plans the student teachers should follow the P A which they have prepared before hand.

4.0. PA of CONCEPT *(Force)*

♦ *Objectives of teaching the concept*

♦ *Analysis of concept* (Force) –Supraordinate concepts (Work. Energy, Torque etc)
Subordinate conceps (Momentum, acceleration etc)

♦ *Analysis of laws of force*

	Periods.
1. Newton's 1st law of motion	2
2. Newton's 2nd law of motion	1
3. Newtan's 3rd law of motion	2
Total	05

(1) Concept/rule	(2) Methodology	(3) TLM	(4) Classroom Interaction	(5) Probing Question	(6) BB Works
1st Law of motion	Lecture, Demonstration Activity	Inertia apparatus	Democratic Interaction	Rickshaw can not be stopped by its passenger. Why?	Def. of Ext & Force, 1st law of motion

Example of 1st. law:- Rest or uniform motion of objects: Trees (rest), Motion of a ball on a mosaic surface(uniform motion appxly.)

Similarly- 2nd *law* & 3rd *law*

Example of force PUSH; PULL; TENSION; THRUST; BUOYANCY; ATTRACTION; REPULSION; RESISTANCE ;

Non-Example: **Pressure.**

Types of learning: *Concept -Learning* (External & external force, Change of momentum. Action, reaction etc.)
Rule learning (1st law, 2nd law. 3rd laws of motion)
Problem solving (Applications of the laws & numerical Problems)

Correlations with life (i.e. necessity of force in our life)

- Higher Education
- Professional life
- Daily life etc.

Evaluation: (1) What would you apply on a body to change its velocity? (Kn)
(2) Why do you feel pain on kicking the ground? (App) etc.

5.0. Pedagogical Analysis of a UNIT of physical Science

5.1 UNIT:

- Select a unit for a particular class *(say* LIGHT for Class VII)
- Identify its instructional objectives (Direct Objectives: Knowledge, Understanding, Application, Skill etc ***and*** Indirect Objectives : Interest, scientific attitude, appreciation etc.)

5.2. Sub-units

- Divide the **unit** into suitable **sub-units**
- Determine teaching time for each **sub-unit**
- Select a sub-unit for detailed Analysis
- Split the sub-unit into several teaching/ learning points/ minor concepts
- For each sub-unit identify ENTERING BEHAVIOUR (Previous Experience) and TERMINAL BEHAVIOUR/ Expected learning outcome (in terms of Kn, Un, App, Skill etc). Some indirect objectives say INTEREST, SCIENTIFIC ATTITUDE (in AFFECTIVE domain) may also be added.
- Suggest for each teaching point/minor concept the **learning strategy**. ***TLM, Probing Questions, BB Works , types of learning*** required therein. (Learning strategy may indicate types of interactions in the classroom, experiment, activity.etc.)

5.3 Whole Unit.

- Identify the KEY concepts and show their Examples, Analogy, Non examples etc for the ***whole unit.***
- Relation of the unit with life (Higher Education, Profession. Daily life).
- Design a unit test

Seminar - Cum - Workshop

PREPARATION OF TEACHING LEARNING MODULE (PEDAGOGICAL ANANLYSIS) ON PHYSICAL SCIENCE

Prof. AMAL KANTI SARKAR
Prof. KAUSIK CHATTERJEE
SATYAPRIYA ROY COLLEGE OF EDUCATION
AA-287, Sector -1, Salt Lake Kolkata - 700 064

In this seminar-cum-workshop, there will be discussion about some aspects of PEDAGOGICAL ANALYSIS on Physical Science.

WHAT :

The word "pedagogy" literally means "the science of teaching". It is thus a masterplan that include a detailed analysis of what is to be done, the nature or standard of the trainees, the instructional strategies, instuctional equipments and the cardinal objectives of instruction. Depending on what the target student group can actually learn and what are the expectations set for learners of that particular stage of development, specific instructional objectives are determined and appropriate set of activities provides. The approach is holistic in nature.

WHY:

The teacher decides instructional objectives, equipments and strategies with every aspect of learning conditions to be created, in view. Favourable conditions for positive learning cell for knowledge of various factors operating in different conditions. Pedagogical analysis is appropriate objectives and strategies in various instructional situations, and assess the level of actual learning at the end. A comprehensive vision of required tasks, strategies for realization of specific goals facilitates effective teaching. So, Pedagogical analysis offers enormous potential for improving the deliver of information in all form of education. It involves various logical steps to arrive at logical inference. It also helps the students understand concepts, priciples or phenomena. Again, the learning environment created accordingly, enables to - i) relate individual fragment of knowledge to real experience in life and work, ii) develop skills and relate facts as a part of a larger organised whole. Realisation of specific goals, facilitated by a detailed planning results in effective teaching.

HOW :

To achieve the above mentioned goals, predetermined by the teacher, the following steps of pedagogical analysis (of each subunit) are adopted :

STEP–1 : Divide the contents of the selected unit into suitables sub-units and arrange the selected sub-units into number of required periods.

STEP–2 : 'Briefly write the essence of the content of the selected sub-unit.

STEP–3 : Write appropriate previous knowledge required for the sub-unit.

STEP–4 : Write appropriate instructional objectives to be selected for the sub-unit.

STEP–5 : Select appropriate teaching strategies for the sub-unit according to the following instructions :

a) Write the name of the methods applied.

b) Mention the teaching aids required.

c) Briefly illustrate the necessary demonstration and/or experimentation required.

d) Mention the necessary Board work required.

e) Write Probing questions related to the sub-unit and provide appropriate answers for them.

f) Mention the necessary software and its use.

g) Prepare a Work sheet for the sub-unit.

STEP–6 : Give suitable examples / illustration / analogies for the sub-unit.

STEP–7 : a) Prepare a Table of specification for the sub-unit.

b) Write six criterion referenced test-items mentioning each with specific criteria for the sub-unit.

Preparation of Teaching–Learning Modules (TLM) Based on Pedagogical Analysis

Prof. Bimal Chandra Das (David Hare Training College, Kolkata)

It is generally agreed that to be optimally effective, institutional programmes should be tailored to individual students. All instructional programmes should capitalise on the usually high individual interests of students making use of strengths and promoting development in areas of academic weaknesses. The quality of an instructional system depends upon (i) the quality of presentation and display, (ii) the nature and extent of student participation and (iii) the accuracy of decisions regarding the assignment of the most appropriate Learning activities for a student considering his/her needs, abilities, aspirations and motivation.

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specify the intent, performance conditions and the minimum acceptable standard of performance.

3. **Rationale :** A narrative statement for the student should be prepared. It should communicate to the learner the overall intent of the module and its importance or relevance to the student's course of study.

4. **Over view :** It is designed to refresh the learner, clarify vocabulary terms and establish a mental set for the learner who basically knows the material. For the learner who is unfamiliar with the content, the overview serves as a preview of that content.

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9. **Resources :** This section is designed to list and enable the learner to locate all the materials and media devices required to successfully complete the module.

10. **General Classroom Management Procedures :** It is necessary to state the location to which a student should submit completed papers or assignments or directions for finding certain types of resource materials and equipments.

11. **Post Test :** This is a criterion–referenced measure designed to require the learner to perform or demonstrate the behaviours as specifically stated in the objectives. The nature, length and conditions of the test will be dictated by the objectives.

12. **Teachers' Instructions :** This section is essential for smooth presentation, management and evaluation of the system. Notes or suggestions to the teacher in terms of methodological approaches or strengths or other special instructions should be included and perhaps, a list of professional sources of information should be enclosed.

The Teaching-Learning Module (TLM) may be any length, usually requiring from about one-half hour to 15 hours to complete. Some modules, when coupled with extended field experience activities, may require a number of weeks to complete.

Components of Teaching–Learning Module

1. **Title :** Central theme or primary idea of the unit of work with code number.
2. **A Set of objectives :** Should specify the intent in behavioural terms with performance conditions and mininum acceptable standard.
3. **Rationale :** Should communicate the overall intent of the module and its importance.
4. **Overview :** To establish a mental set and to serve as a preview of the content.
5. **Pre test :** A self-assessment instrument to Know whether the student possesses the prerequisite information for probable success with the module.
6. **Self-Evaluation :** (a) to bypass the module, (b) to guide to those portions that the student needs to study and (c) to allow the student to check his progress before final evaluation.
7. **Learning Activities and Instructional Alternatives :** This is the heart of the module and the core of teaching-learning activities. Several alternative learning strategies are generally provided using multimedia, multimode, multicontent and multi activities.
8. **Special Student Directions :** Indicates the use of specialised equipment or facilities with implications for time and scheduling of activities.
9. **Resources :** To list and enable the learner to locate all the materials and media devices required for successful completion of the module.
10. **General Classroom Management Procedures :** To state the location to which a student should submit completed papers or assignments or directions for finding out certain types of resources or equipments.
11. **Post-Test :** This is a criterion-referenced test based on the objectives requiring the learner to perform or demonstrate the intended behaviours as specified in the objectives.
12. **Teachers' Instructions :** This section is essential for smooth presentation, management and evaluation of the modular system. Methodological approaches or special instructions can be included.

Pedagogical Analysis for Curricular Transaction

1. **Content Analysis (Content Elements and Structuring) :** Facts and Ideas; Concepts; Principles; Rules; Laws; Procedures; Conventions (Examples, Non-Examples, Illustrations, Tables, Graphs etc. to be used for each content elements)
2. **Instructional objectives :** Behavioural objectives using Action Verb, Conditions and Standard of Performance under cognitive, Psychomotor and Affective Domains.
3. **Two Dimensional Specification Table :** With objectives and content for development of Summative Evaluation Instrument following CRT principles.
4. **Learning Principles :** Behavioural, cognitive and constructivist Principles.
5. **Media Selection :** Visnals, Graphics and Media–Mix.
6. **Teaching Strategies and Methods :** Learner-controlled, System-Controlled, Group-Controlled, Team Teaching and Systems Approach.

   Use of Teaching Aids–Interaction by asking formative investigatory and probing questions.
7. **Procuring and providing feedback and reinforcement and remedial prescriptions.**
8. **Transfer and Retention.**
9. **Effectiveness of Instruction.**

PLANNING TEACHING

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Planning of teaching refers to the process of **"Managing Teaching-Learning"**. The planning is most important task of a teacher. He has to utilise his imagination, creativity and insight in **analysing the teaching content into its elements** and **in defining** and **formulating the Learning objectives** in behavioural terms.

This planning is very scientific in nature because the teacher has to **analyse the content systematically and arrange its elements in a logical sequence that may suit to students' Learning and desired objectives can be achieved.**

Thus, a teacher has to perform three activities in this step :

(i) Analysing the **task** or **content analysis.**

(ii) **Identification of teaching objectives.**

(iii) Writing objectives in behavioural terms.

(1) TASK ANALYSIS

Ryle has given the concept of task analysis. The **focus of training psychology** is to analyse the task to be performed.

This concept is very useful for developing **the understanding and skills for teaching and training.**

This has emerged **against** the theories of learning because **theories of Learning could not provide substantial solution for the problems of classroom teaching and Learning.**

The **effective teaching** can only be organised by analysing the content.

The task analysis has **four** characteristics :

(a) Description of **learning activities.**

(b) Identification of **desired behaviour.**

(c) Identification of appropriate situation and **techniques of motivation,** and

(d) **Developing criterion test** for measuring the desired behavioural change.

The task analysis **provides the basis for selecting appropriate teaching tactics and strategies** and **formulating the objectives of teaching.**

Types of Task analysis :

The task analysis is classified into three types which are quite different to each other and serve different purposes these are–(i) Content analysis or topic analysis. (ii) Job analysis, and (iii) Skill analysis.

Content analysis : In this type, the content or subject-matter is analysed into sub-

topics and subtopics into elements and these are arranged into a Logical sequence.

This type of analysis is purely educational and intellectual activity.

(ii) **Job analysis :** This type concerns with tasks which are related to some professional or social activity.

It **involves** psychomotor activities for example: Teacheer tasks, Doctor tasks Engineer tasks etc.

(ii) **Skill analysis :** This type is also related to the psychomotor activities but is concerned with the most specific skills.

The skill analysis is included job analysis where mainly skills are analysed; but skill analysis is done **for specific activities** for example Questioning, Motivating and diagnosing etc.

The pupil-teachers should have knowledge and sill of content analysis which is basis for preparing instructions and formulating the objectives of teaching.

Defination of content Analysis : I K Davies : "It is the analysis of topic or content unit to be taught, into its constituents or elements and arrange them in a Logical sequence".

A content is broken down into its elements. Each element is performed by **using specific tactics,** and **the specific objectives can be realised.**

The elements are arranged in a Logical sequence **so that positive transfer** of Learning can be facilitated.

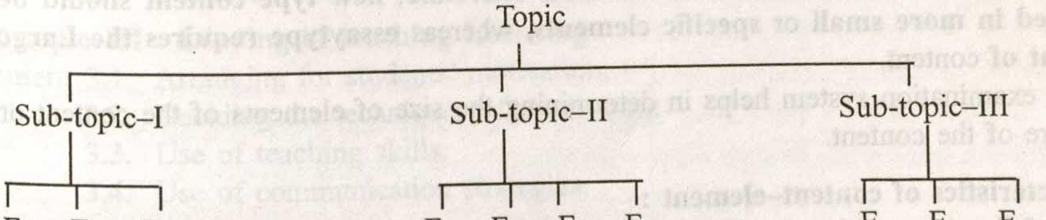
The teacher has to employ his imagination, creativity, and insigt in synthesizing the elements of the content.

There are various techniques (Gloser 1963, Homme 1962, Macnar 1965) of content analysis.

Davies' Matrix Technique is most useful and practicable.

In this technique, a content is broken down into sub-topics and each sub-topic is further broken down into elements. The sub-topics are arranged in Learning sequence.

CONTENT ANALYSIS CHART



Sources of content Analysis :

The teacher has to make use of various souces for a content analysis, then and then only he will be able to present **the correct structure** of the content.

The teacher must acquire the mastery over the content.

The following **sources** are essential for content analysis :

(i) Study of standard text books.

(ii) Considering the needs of the Learners.

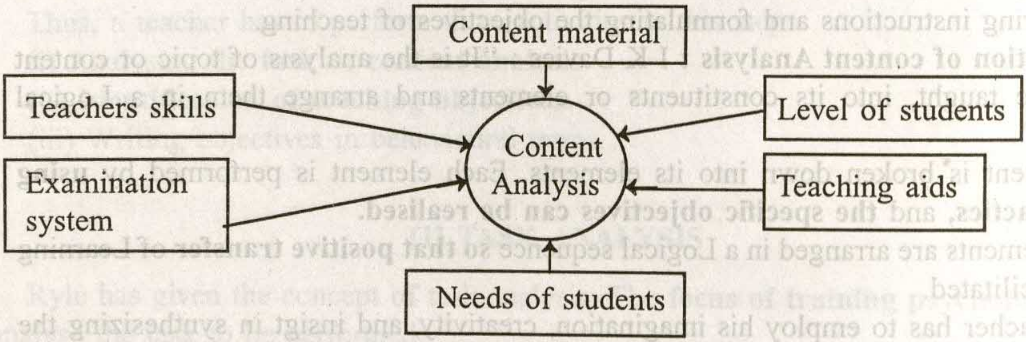
(iii) Keeping in view the objectives of teaching-learning.

(iv) Considering the examination system,

(v) Use of teaching aids, and

(vi) Teacher's own skills of teaching.

These souces have been shown in an integrated form in the following chart.



The **mastery behaviour is determined** in content analysis.

It is based upon the needs of students, Level/grade of education. The same content is taught at **various Levels** but the structure of content is determined by considering the **Level of teaching.**

(Memory, Understanding, Reflective)

The teacher **should consult and study the standard books** available on the content, so that appropriate content-structure can be determined.

The teacher should also review the examination papers. The objective type questions **require specific information about content.** Therefore, **new type content should be analysed in more small** or **specific elements,** whereas **essaytype requires the Large element of** content.

The examination system helps in determining the size of elements of the content or structure of the content.

Characteristics of content–element :

The following are the chief characteristics of content element :

(i) The student **can exhibit by his activity** that he **can understand the element.**

(ii) The **comprehension of an element can be evaluated by a question.**

(iii) The Level of the element can be examined **by behaviour of the student.**

The level of the element may be knowledge, comprehension and application, etc.

(iv) The understanding of various elements **can be tested with the helps of students' behaviour.**

(v) The **emitted response** for an element indicates the **change in behaviour.**

The knowledge and understanding of a concept (for a fact) may be given by arranging the elements in sequence.

The arrangement of elements in a sequence.

The Logical sequence of the elements can be made on the basis of the folowing rules (i.e. maxims of teaching).

(i) From known to unknown

(ii) From simple to complex.

(iii) From concrete to abstract.

(iv) From observation to Logical thinking.

(v) From Part to whole.

The arrangement of elements based upon these rules **increases the probability that logical sequence of the elements may be psychologically valid.**

The **concept of task analysis is practical in nature.** Therefore, it has been illustrated with the help often example.

Example :

Topic–Management of teaching Learning

Sub-topic–I : Planning of teaching Learning.

Element 1.1. Task analysis.

" **1.2.** Identification of objectives.

" **1.3.** Writing objectives in behavioural term.

Sub-topic–II : Organizing teaching Learning

Element 2.1. Selection of teaching strategies.

" **2.2.** Selecton of teaching tactics.

" **2.3.** Selection of teaching aids.

" **2.4.** Decision for rules and techniques of instruction.

Sub-topic–III : Leading of teaching Learning

Element 3.1. Arranging for students' motivation.

" **3.2.** Deciding the techniques of motivation.

" **3.3.** Use of teaching skills.

" **3.4.** Use of communication strategies.

Sub-topic–IV : Controlling of teaching learning.

Element 4.1. Evaluation of learning activities.

" **4.2.** Evaluation of learning outcomes

" **4.3.** Organising learning objectives

" **4.4.** Providing the feed back to the earlier steps.

(2) Indentification of teaching Objectives :

After analysing the content to be taught, the **teaching objectives** are to be determined because **teaching is a meaningful and purposeful activity.**

The teacher can identify **his teaching objectives with the help of his knowledge and understanding of educational objectives.**

Definition and meaning of objects : The objective is a statement or form of category which suggests any kind of change. The objective has the following characteristics.

(i) It provides **directions to the activity** which is designed for **achieving an ultimate goal.**

(ii) It helps **for planned change** (পরিকল্পিত বা বিবর্তন)

(iii) It provides **the basis for organising activities.**

Educational objects শিক্ষামূলক উদ্দেশ্য	**Teaching/Learning objectives** শিক্ষন/শিখন উদ্দেশ্য
These are generally in the statement form. These are broad and philosophical in nature. (Social philosophy is the source of these objectives). These imply the teaching objectives. These are achieved within a long duration. All school subjects are concerned with these objectives. **Examples :** Personality development, feeling of national integration.	These are specific, direct, practical and psychological in nature. The teaching strategies and tactics are selected on the basis of teaching Learning objectives. The educational objectives are achieved with the **integrating effect** of these objects. These are achieved within a period of class-room teaching. **Examples :** Subject specific knowledge, skills, interests etc.

Necessity of determining teaching Learning objectives :

সমাজদর্শন ও শিক্ষার্থীর মনস্তত্বের ভিত্তিতে শিক্ষামূলক উদ্দেশ্য নির্ধারিত হয়। এগুলির প্রেক্ষিতে শিখন-ফলশ্রুতি (Learning outcomes) কি হওয়া উচিত, **শিখন অভিজ্ঞতা (Learning experience) কি প্রকৃতির এবং কতটা বিস্তৃতির হওয়া উচিত, মূল্যায়ন তথা পারদর্শিতার অভীক্ষা কিভাবে উদ্দেশ্য যুক্ত হওয়া উচিত (Specification table কিভাবে রচিত হওয়া উচিত)** ইত্যাদি নির্ধারিত হয়।

এককথায় (i) শিখন অভিজ্ঞতার রচনা/নির্বাচন করা। (ii) শিক্ষনকার্য পরিচালনা করা এবং (iii) শিক্ষার্থীদের অগ্রগতির তাৎপর্যপূর্ণ মূল্যায়ন করা ইত্যাদির জন্য শিখন উদ্দেশ্যগুলি নির্ধারণ সনাক্তকরণ করা অতীব প্রয়োজন। **Need for writing objects in behavioural terms** আর একটি কথা মনে রাখতে হবে যে,

শিক্ষামূলক/শিক্ষন/শিখন উদ্দেশ্য গুলিকে সমাজকাঙ্খিত আচরণগত পরিবর্তনের পেক্ষিতে অনুবাদ করতে হবে। (to translate in terms of socially desirable behavioural change) তবেই **entering behaviour** (প্রাবেশিক আচরণ) এবং **Terminal behaviour** (চূড়ান্ত আচরন) সুসংজ্ঞায়িত ও পরিমাপযোগ্য হবে

Teaching/Learning obj + Action verb = Behavioural objective

পরিবেশ সম্পর্কে জ্ঞানবৃদ্ধি হবে।
" " সচেতন " " } Learning Objective

পরিবেশের সংজ্ঞা বলতে/লিখতে পারবে।
পরিবেশের দূষন ব্যাখ্যা করতে পারবে। } Behavioural Objctive

The following are the **main advantages of writing objectives** in behavioural terms.

(i) Teaching activities are determined and delimited. (শিক্ষন কার্যাবলীর নির্ধারণ ও সীমায়িত করন সহজ হয়।)

(ii) Teaching and Learning process are integrated for effective learning outcome শিক্ষন ও শিখন প্রক্রিয়াদ্বয় সমন্বয়িত হয়→ কার্যকর শিখন ফলশ্রুতি প্রাপ্তির জন্য

Independent Variable	Intervening variable	Dependent variable
T	(L) = Changing Behaviour	

(iii) The appropriate **teaching strategies** and tactics can be selected for effective learning. (Strategy–কুশলী সৈন্য পরিচালনা। Tacties–কর্মদি সাধনের কৌশল, কৌশলী পন্থা, ব্যুহ রচনা করে—সুকৌশল পরিকল্পনা।

(iv) Teaching and testing can be made objective centred. Thus, testing may be based upon teaching.

Seafold states the following advantages of behavioural objectives :

(a) Specification of objectives.

(b) Selection of items for preparing test.

(c) Teaching can be related to learning.

(d) Integration between Learning experiences and change in behaviour.

(e) Selection of appropriate teaching strategies, tactics and teaching aids.

Methods of writing objectives in behavioural terms.

(i) Drucker (1954) সর্বপ্রথম আচরন গত উদ্দেশ্য সম্পর্কে নতুন ভাবে বিস্তৃত ধারনা দেন।

(ii) B & Bloom (1956) এই ধারনাকে পারদর্শিতা অভীক্ষার অভীক্ষাপদ রচনার ক্ষেত্রে তথা পরীক্ষা সংস্কারের ক্ষেত্রে প্রয়োগ করার কথা বলেন।

(iii) Robert Magor (1962) Programmed instruction রচনার জন্য আচরনগত উদ্দেশ্য লিখনকে

জনপ্রিয় করেন। তিনি cognitive এবং affective domain এর action verb এর list দেন। তিনি Bloom-এর Taxonomy follow করেন।

(iv) Robert Miller (1962) psychomotor objectives আচরন সাপেক্ষে লেখার ধারনা দেন।

(v) NCERT (1972) [Regional college of Education Mysore-RCEM) cognitive, affective এবং prychomotor domain-এ আচরণ সাপেক্ষে উদ্দেশ্য লিখনকে আরও সহজ করে।

শিক্ষাক্ষেত্রে Magor এর approach এবং training objects-এর ক্ষেত্রে Miller-এর approach খুব জনপ্রিয়। এছাড়াও Perceptual domain-এর ক্ষেত্রে Moore (1967) অর্থাৎ প্রতক্ষন ভিত্তিক অঞ্চলের ক্ষেত্রে আচরনগত উদ্দেশ্য রচনার একটি ধারা প্রবর্তন করেন।

Taxonomy of educational objectives (to indentify Learning outcomes) :–

Taxonomy–Process of classification শিক্ষামূলক উদ্দেশ্যের Taxonomy তে উদ্দেশ্যগুলিকে সুব্যবস্থিতভাবে প্রনালীবদ্ধ করা হয়েছে। (Systematised way তে enlisted করা হয়েছে)।

এই উদ্দেশ্যগুলিকে চারটি প্রধান শ্রেণিতে/ক্ষেত্রে (Four major demonstration-এ) তালিকাবদ্ধ করা হয়েছে।

The teacher performs more prescriptive function in the presentation of the content whereas student is less active. He helps the teacher in demonstration etc.

(iii) Evaluation functions : This function examine the effectiveness of prescriptive functions.

The criterion of evaluation is the realisation of objectives. If objectives are not realised, the prescritive functions are to be modified.

This function has two main activities. (a) Construction of criterion test. (b) Evaluation of change of behaviour.

The student, as dependent variable, diognosis the test items on the basis of his achievements, abilities and skills.

Structure of teaching :

(1) Signs and symbols in teaching : When we analyse teaching, the signs and symbols are obtained. The teacher uses the signs and symbols at diagnostic stage and the student begins to understand and takes interest in them.

The teacher also employs signs and symbols at prescriptive and evaluative stages of teaching. The students also use them in communications and explaining the teaching concepts. Thus, these are the elements of teaching structure.

(2) Teaching as a Linguistic process : In addition to use of singns and symbols in the instruction, the teacher uses Language for communicating ideas to the pupils. The teacher uses language–in explaining the concepts and ideas in describing facts and events in–motivating the student in–class room verbal interaction SMI process fails without use of language (besides signs and symbols).

(3) The logic of teaching : The teaching process involves both language and logic. The logic is more useful for good teaching.

The teacher organises the elements of content logically so that positive transfer of learning may be faclitated/encouraged.

The logic is used in all the three functions of teaching, diagnostic, prescriptive and evaluative. The criterion test items we arranged logically. The planning organising, leading and controlling of teaching are developed with the help of logical thinking of the teacher.

The Model of Memory level of Teaching : Given by **Herbert.**

The Model of Understanding level of Teaching given by **Morrison.**

The Model of Reflective level of Teaching Given by **Hunt.**

Conditions of learning : Robert Gagne (1965) believes that learning cannot be explained comprehensively with the help of learning theories alone. These learning conditions are basic to understand the concept of teaching. Eight different **types of situations** in which human learning conditions have been identified (by Gagne′) are the following :

(1) Signal Learning. (2) Stimulus response Learning. (3) Chain Learning. (4) Verbal association. (5) Discrimination Learning. (6) Concept Learning. (7) Rule Learning. (8) Problem solving.

I. K. Davies recognises five basic Learning structures out of eight classes of Gagne′. These are (i) Signal structure. (ii) Chain structure. (iii) Multiple discrimination structure. (iv) Concept structure. (v) Principle structure.

Teaching strategy : Teaching strategy establishes the relation between teaching and learning in view of achieving the objectives.

Teaching strategies includle **broad** methods of instruction eg, a lecture strategy, a tutorial strategy, a case study strategy, a programmed instruction strategy.

Broudy (1963) : Method refers to the formal structure of the sequence of acts commonly denoted by instruction. **The term method covers both strategies and tactics of teaching** and involves the choice of what is to be taught and in which order it is to be presented.

Method is **more general**, it includes techniques also.

Strategy has been borrowed from **military** science to **pedogogy method.**

Assumption regarding teaching strategy is that teaching is a service and method assumes that teaching is an art.

The strategies are implemented by **tactics of teaching** and methods are implemented by **techniques of teaching.**

The main focus of teaching strategy is to **actieve objective by creating appropriate learning conditions.** The teaching method aims at the **effective presentation of subject-matter** to have mastery over it.

Teaching tactics : Are the ways of implementing a teaching strategy. The tactics are more concerned with creating appropriate knowning structures.

A tactics of teaching is an unit of teacher behaviour which is helpful for achieving instructional objectives.

A tactics may range from non-verebal behavour to more complex verbal behaviour of a teacher which is interrelated with pupil behaviour.

Strategies

Autocratic style	**Permissive style**
Lecture–stretegy	Question–Answer strategy
Lession-demonstration	Heurastic strategy.
Tutorial strategy	Project strategy.
P I Strategy	Group discussion strategy
Practical tutorial etc.	Review storming
	Brain storming strategy
	Role playing strategy etc.
	CAI.

The teaching tactics are used for generating appropriate learning structure. One teaching tactics is used in various teaching strategies.

Learning strategies	**Teaching Tactics.**
(1) **Signal Learning**	(a) Give a stimulus to a student and cause him to respond. (b) Reinforce him for the correct response. (Ignore wrong response.) (c) Shape his responses to mastery behaviour. (d) Practise the responses.
(2) **Chain Learning**	(a) Give student a bird's eye view of the chain. (b) Establish chain and work forward, or work backward. (c) Practice the chain.
(3) **Multiple discrimination Learning**	(a) Make all stimuli and response as distinctive as possible. (b) Present all conditions to be **discriminated** at once. (c) Force student to discover discrimination. (d) Practice discrimination.
(4) Concept Learning	(a) Some as above (b) Present all conditions to be **Generalised** at once. (c) Force student to generalise. (d) Practice the concept.

(5) Principle Learning	(a) Give student a birds eye view of the principle.
	(b) Establish a chain of concept which work forward or backward.
	(c) Force student to infer to a principle.
	(d) Practice principle

Cognitive objectives and associated action verb (Mager's approach)

Objectives :	**Associated Action Verbs.**		
1. **Knowledge**	Define	Write	Underline
	State	Recall	Select
	List	Recognise	Reproduce
	Name	Label	Measure
2. **Comprehension**	Indentify	Illustrate	Explain
	Justify	Represent	Judge
	Select	Name	Contract
	Indicate	Formulate	Classify
3. **Application**	Predict	Choose	Construct
	Select	Find	Complete
	Assess	Show	Use
	Explain	Demonstrate	Perform
4. **Analysis**	Analyse	Select	Justify
	Indentify	Separate	Resolve
	Conclude	Compare	Breakdown
	Differentiate	Contrast	Criticise
5. **Synthesis**	Combine	Argue	Select
	Restate	Discuss	Relate
	Summarise	Organise	Generalise
	Precise	Derive	Conclude
6. **Evaluation**	Judge	Support	Identify
	Evalute	Defend	Avoid
	Determine	Attach	Select
	Recognise	Criticise	Choose

This action verbs can be used for defining the educational objectives of cognitive domain (Entry + terminal behaviour) and also for examination questions.

Affective domain objectives and associated Action Verbs (Mager)

Objectives	Associated Action Verbs.		
1. **Receiving**	Listen	Accept	Be aware
	Attend	Receive	Favour
	Prefer	Perceive	Select
2. **Responding**	State	Select	Record
	Answer	List	Develop
	Complete	Write	Derive
3. **Valuing**	Accept	Increase	Indicate
	Recognise	Develop	Decide
	Participate	Attain	Influence
4. **Organisation**	Organise	Find	Associate
	Judge	Determine	Form
	Relate	Correlate	Select
5. **Characterization**	Revise	Accept	Demonstrate
	Change	Judge	Indentify
	Face	Develop	Decide

The psychomotor objectives cannot be written by Mager's approach (where emphasis is on **action verbs rather than mental processes).**

This list of action verbs indicates that there **is overlapping of action verbs** in different categories.

Mager's approach is more suitable for development of PI.

The RCEM Approach : (1972)

This approach modified the Bloom's Taxonomy a Little.

Bloom's Objectives	RCEM Objectives	Mental process or Abilities
Knowledge	Knowledge	1.1. Recal
		1.2. Recognise
Comprehension	Understanding	2.1. Seeing relationship
		2.2. Cite example
		2.3. Discriminate
		2.4. Classify
		2.5. Interpret
		2.6. Verify
		2.7. Generalise
3. Application	Application	3.1. Reason out
		3.2. Formulate hypothese
		3.3. Establish
		3.4. Infer
		3.5. Predict
4. Analyse	Creativity	4.1. Analyse
		4.2. Synthesis
		4.3. Evaluate
5. Synthesis		
6. Evaluation		

Only 17 mental process are identified for writing objectives.

Cognitive Objectives

1. Knowledge (Reproduction)

(a) Knowledge of specifics (i.e. facts and terminology)

(b) Knowledge of ways and means.

(c) Knowledge of Principles, theories and generalizations.

2. Comprehension :

(a) Translation of specifics (Individual knows what is to be communicated and can make use of material, (facts, principles theories).

(b) Interpretation of some specifics.

(c) Extrapolation of the above content.

3. Application :

(a) Make generalisation of facts, principles and theories.

(b) Diognose the weakness of these contents.

(c) Apply these contents use.

4. Analyse :

(a) Analyse the elements of communication.

(b) Establish the relationship among the elements.

(c) Formulate some principles to organise the elements.

(This category **involves breakdown of a communication into its elements** such that relative hierarchy of ideas is made clear)

5. Synthesis :

(a) Unique communication by arranging different elements.

(b) Suggest new plan by combining all elements.

(c) Establish an abstract relationship among defferent elements.

(In this category, all the elements are organised in such a way that they can form a unique whole).

6. Evaluation :

(a) The internal Judgement of the material and methods.

(b) The external judgement of the material and methods.

(It includes quantitative and qualitative judgement about the extent to which material and method satisfy criteria)

Activities of Teaching : Thomas F Green has classified teaching activities into three categories :

(I) The Logical activities of teaching : (a) Explaining, (b) Concluding, (c) Inferring, (d) Giving reason, (e) Amassing evidence, (f) Demonstrating, (g) Defining and (h) comparing.

(II) The strategic activities of teaching : (a) Motivating, (b) Counselling, (c) Evaluating, (d) Planning, (e) Encouraging, (f) Discipling and (g) Questioning.

(III) The instructional activities of teaching : Are those activities that **arish primarily** because of the way the teacher's work is organised by the institution. (a) Collecting money, (b) Petrolling ball, (c) Attending meeting, (d) Talking attendance, (e) Consulting parents, (f) Keeping regards etc.

Teaching Variables : Teaching **process** involves three variables :

(i) Independent variable : The teacher.

(ii) Dependent variable : The student.

(iii) Intervening variables : The content and strategies of presentation.

(I) In the role of independent variable the teacher provides learning expences to the peopils. The planing, organising, leading and controlling of teaching is done by him.

(II) The student is the dependent variable (in the teaching process) because he/she has to act according to the planning and organisation of the teacher.

(III) The content of teaching, strategies, tactics of teaching and techniques of motivation etc. are known as intervening variables.

The **interactions between teacher and student is performed through the intervening variables.**

The content determines the mode of presentation; telling, showing and doing.

Functions of teaching variables :

The independent and dependent variables perform three major functions : (i) Diognosis, (ii) Prescription and (iii) Evaluation.

(I) Diognostic functions – The teacher has to diognose the **entering behaviour of the learner** and **stracture of the content for writing objectives** in behavioural terms.

This function helps the teacher to talle decisions about (a) Entering behave of ?? (b) Analysisng teaching problems; (c) Individual variations, and (d) Content analysis in view of learning conditions.

The teacher uses two approaches in this diognostic function.

(a) A diognostic test is administered for entering behaviour of the pupils.

(b) The content is analysed into elements which are then arranged logically in a sequence.

The **student as dependent variable** diognoses on the basis of his perceptions about the teacher's functions.

(II) **Prescriptive functions**–The teacher takes decision about teaching strategies and tacties to be used.

The main objective of this function is to bring desirable change in the learner.

Therefore, teaching techniques, feedback devies etc. are to be selected individual differences are to be kept in mind.

Stage–II

Interactive phase of teaching substages/operations/activities :

(i) Sizing up the class.

(ii) Diognosis of the learners.

(iii) Action or Reaction (Initiation or response)

(a) selection of stimuli.

(b) Presentation of stimuli.

(c) Choice of strateges.

(d) Development of strategies.

(I) The teacher locates, identifies the trouble some/helfull sports; rolls his eyes upon students faces; perceives the size of the class; identifies the discouraging and encouraging students.

The pupils size up the personability of the teacher.

(II) The teacher tries to diagnosetudents' (a) abilities, (b) attitude & interest, (c) academic background.

(III) (a) Selection of stimuli

Verbal & Nonverbal

Proces, gestures, expressions through face/eyes/movements

The Teacher must

select appropriate, desirable functional stimuli

(b) Presentation of the stimuli :

Its (i) Form (ii) Context (iii) Order or Sequences

Stimuli should be preseuted so that proper motivation may be provided.

should be presented with some special reference and context.

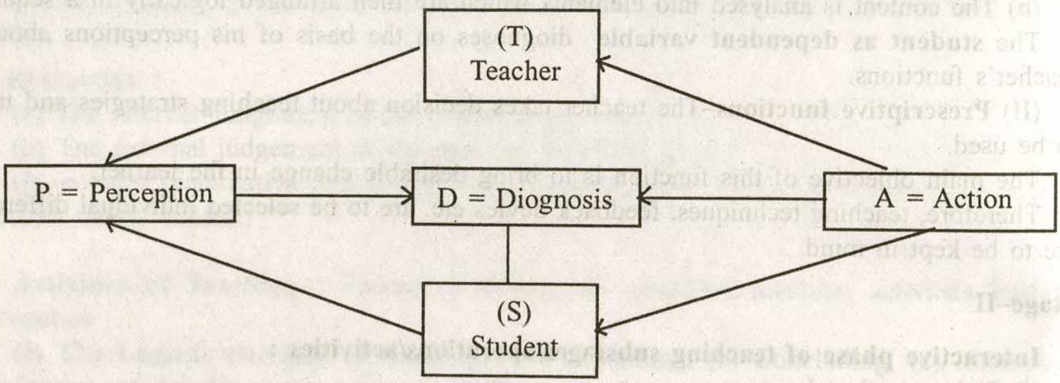
ORDER or SEQUENCE : Should be presented in a logical sequence so that behaviour repertoire may be established.

(c) Feedback or Reinforcement.

It is a **condition** which will increase the probability that a particular response will be repeated in future.

+Ve reinforcer : Praise, appreciation, reward, knowledge of result etc.

–Ve reinforcer : decrease the probability of re-occurring the undesirable response eg. reproof, punishment rebuke etc.



The reinforcement is applied for three purposes

(i) For strengthening response (+ve reinforcer)

(ii) For changing response (+ ve/ –Ve ")

(iii) For modifying response (–ve ")

(iv) (Deviation of strategies)

The strategies of reinforcing the students of controlling their verbal and nonverbal behaviour are used for importing the subject content effectively.

Stage III : Post active phase of teaching **Main operations involved.**

(i) Defining the exact dimension of the behavioural change

(ii) Selecting appropriate testing device.

(iii) Changing/improving strategies of teaching.

(i)–The Teacher evaluates the expected behavioural change with actual behavioural change (ofstudents).

(ii)–The Teacher selects/constructs certain tools and techneques to assess the various desired dimensions of hebaviour.

The tools should be reliable, valid and objective in nature.

(iii)–The students' testing result is also used for evaluating the effectiveness of instructions and teaching strategies.

Example of Pedagogical analysis on Physical Science following the formal of Calcutta University B. Ed. curriculam

PEDAGOGICAL ANALYSIS

Unit : Newtons Laws of motion **Class : IX**

Sub-Units :	**Periods required**
1) First Law of Motion	1
2) Second Law of Motion	1
3) Third Law of Motion	1
One class will be alloted for remedial teaching	1

No. of Periods–4

ANALYSIS OF SUB UNIT

Sub unit–First law of motion

Brief summary of concepts/matter :

Concept of inertia : The property of the bodies to stay at rest or retain their uniform linear motion in the absence of the applied forces, is known as the inertia.

Types of ineratia. Inertia of rest and inertia of motion. Examples of two types of inertia : (1) Example of a passenger standing in a bus at rest and the bus suddenly starts moving. (2) Example of a passenger standing in a bus moving with uniform velocity and the bus suddenly stops.

Relation of inertia with force. Force is required to change the state of inertia of a body.

Statement of Newton's First law of motion. Everybody persists in its state of rest or of uniform motion in a straight line unless it is compelled to change that state by forces impressed on it.

Few life-centric examples : Push and pull situations. Definition of force. It is the external agency which tends to change or really changes the state of rest or of uniform motion in a straight line of a body.

Examples of force–tension, push, pull, attraction, repulsion etc.

Previous Learning :

1) Idea of the frame of reference

2) Rest and motion (including time)

3) Concept of rest and motion with reference to position, displacement, velocity and acceleration.

Objectives

Cognitive :

Knowledge : Students will be able to

1) define (a) inertia (b) force
2) cite examples of different types of inertia.
3) state Newton's firtst law of motion.

Comprehension : Students will be able to

1) explain mass as a measure of inertia.
2) compare the inertia of rest and inertia of motion.
3) predict the force to be the cause of the change of the motional state.
4) predict qualitatively the different effects of force.

Application : Students will be able to

1) verify Newton's first law of motion using simple devies.
2) explain why it is not possible to move a car by pushing it from inside.
3) predict cause-effect relation in case of different life-centric situation associated with the property of inertia.

Affective : Development of interest and scientific attitude among the students.

Skill : Students will be able to

1) design different experimental setup.
2) construct different models related to the concept of Newton's first law of motion.
3) prepare different cherts related to the concept of the first law of motion.

TEACHING STRATEGIES

Broad Method of Teaching :

Lecture : Teacher may use lecture to define inertia of rest and motion, statement of the first law of motion, definition of force.

Demonstration : Teacher may demonstrate different experiments in support of his explanation of the concept of inertia and its relation with force and mass (seeking participation of the students by asking thought provoking questions.)

Discovery : Partially heuristic approach may be followed by the teacher while teaching the concept of inertia and its relation with force and mass.

Experimentation : Observing the demonstration by the teacheer, answering the probing questions students may perform similar experiments independently.

Teaching Learning Materials :

Equipment with brief indication of use :

1) Using the experiment of glass, postcard and coin, teacher may demonstrate the concept of inertia of rest.

2) Demonstrating the motion of a plastic ball on a smooth surface teacher may explain the concept of the inertia of motion.

3) Using spring balance and different masses teacher may demonstrate the concept of mass as a measure of inertia.

Software and its use :

1) Slide presentation using Power point can be used to elucidate any elerment of the subunit.

2) In addition to this computer simulation may also be utilised to explain the concepts of two types of inertia.

3) Programmed Learning Materials may be used to teach the relation of mass with inertia.

Use of chalk/white board :

Using the chalk teacher may write down the definition of inertia, types of inertia, statement of Newton's first law of motion and definition of force on the board.

Probing questions with answers :

1) Why it is not possible to move a car sitting inside it?

As the force applied by the person sitting inside the car is an internal force for the system, it would be unable to change the state of rest of the car.

2) Why do we beat the rug to clean it?

Being beaten the rug moves, but the dust particles retain the inertia of rest. Since the rug is displaced from its initial position, the dust particles drop down.

Work sheet :

Answer the following :

1) One body has mass double of the other body. Which one will show larger inertia?

2) An electric fan continues to rotate even after switching off. Predict the type of inertia.

Example–II

Pedagogical Analysis

Unit : Chemical Bonding Class : IX

Subunit : 1 – Primary idea about chemical Bonding (Period–1)

Subunit : 2 – Electrovalency (Period–1)

Subunit : 3 – Covalency (Period–2)

Total period : 4

Subunit 1 : Primary idea about Chemical Bonding.

Elements of learning : E1.1 –Reason behind combination of atom.
E1.2–Valence Electron
E1.3–Octate rule.
E1.4–Defination of chemical Bonding
E1.5–Types of chemical Bonding

Brief summary of subunit :

E1.1– Inorder to get stability the atoms combine together.

E1.2– Electrons situated at the outermost shell in an atom is called valence electron.

E1.3– Every atom has a tendency to acquire eight electrons in its valence shell. This is called octate rule

E1.4– In order to acquire eight electrons in the valence shell two or more atoms combine either by sharing or by loosing/gaining of electrons in its valence shell, is called chemical Bonding.

E1.5– Mainly there are two types of chemical bond, e.g. (i) Electrovalency & (ii) Co-valency.

Teaching Strategies :

Broad Method of teaching :

E1.1– Lecture Method.
E1.2– Lecture and demonstration Using chart.
E1.3– do
E1.4– Lecture Method
E1.5– Lecture Method.

Teaching learning Materials :

1. Chart showing distribution of electrons of an atom indicating valence electron.
2. Another same type of chart for the indication of valence electron by the students.

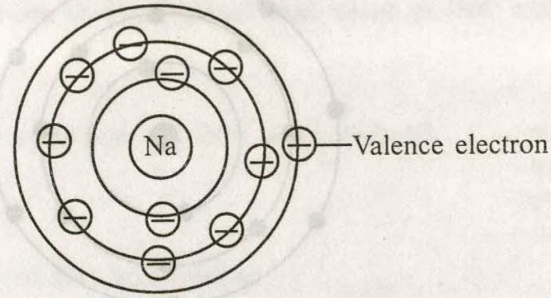
Use of chalk/Board

Teacher will write on Board as follows :

(i) Definition of valence shell election.
(ii) Statement of octate rule.
(iii) Definition of chemical Bonding.
(iv) Types of chemical bonding.

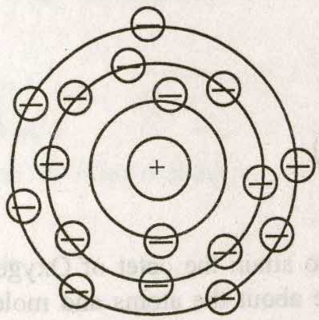
Chart for Teaching learning meterials

Fig. 1



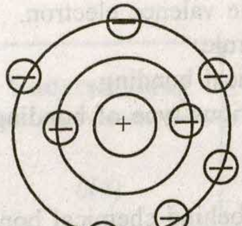
Na-atom.

Fig. 2



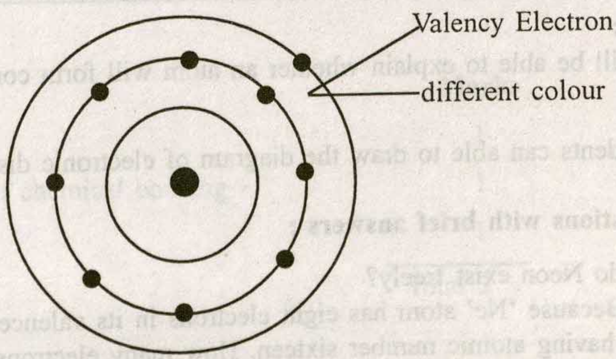
Say the no. of valence electrons in the above diagram of atom.

E1.3 Fig.3.

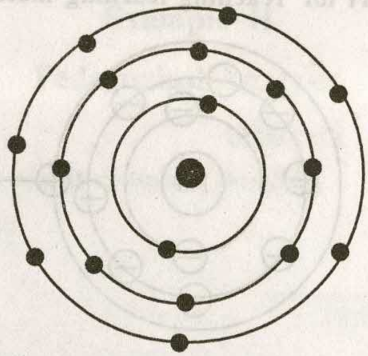


How many electrons will require to attain the octate of oxygen atom.

E12



Na-atom.



Say the no. of valency electrons in the above atom.

E 13. same chart as E12



How many change will regional to attain the octet of Oxygen atom & A and 6 atoms?

Previous learning : They can state about the atoms and molecules. They can write the electronic distribution of all atom.

Objectives : Cognitive Knowledge :

1. The students will be able to define valence electron.
2. They will be able to state octate rule.
3. They will be able to define chemical bonding.
4. They will be able to indentify various type of bonding.

Comprehension (Understanding) :

1. They will be able to give reason behind chemical bonding.
2. They will be able to differentiate valence electron(s) from the other electrons.
3. They will be able to identify no of valence electron(s) in an atom.

Application :

1. They will be able to explain whether an atom will form compound or not.

Skill :

The students can able to draw the diagram of electronic distribution of atom.

Probing questions with brief answers :

(i) Why do Neon exist freely?
Ans. Because 'Ne' atom has eight electrons in its valence shell.

(ii) Atom having atomic number sixteen. How many electrons require to attain its octate?
Ans. Two.

(iii) Why 'Na' atom is reactive whereas 'Na^+' is nonreactive?

Ans. Because, 'Na' contain one atom in valence shell where as 'Na^+' contain eight electron in valence shell).

Worksheet :

1. Which of the following elements does not form chemical bond. a) He b) Na c) Cl
2. State octate rule.
3. Mention the different types of chemical bonding.

Examples to illustrate concept/content :

Concept/content	Examples
1. Atoms which can combine→	Na, K, Cl
2. Atoms which can not combine→	He, Ne, Ar.
3. Atoms having eight electrons in valence shell→	Ne, Ar.
4. Ions obeying octate rule→	Na^+, K^+, Ca^{+2},
5. Types of chemical bonding→	Electrovalent covalent bonding.

CRITERION REFERENCED TEST

Sub Unit	Knowledge	Understanding	Application	Skill	Total
Primary concept of Chemical Banding	3(3)	6(4)	4(3)	2(1)	15
% of Marks	20	40	26.6	13.4	100

Knowledge : **Marks**

1. State octate rule→ 1
2. Mention different types of chemical bonding→ 1
3. Define valence electron→ 1

Total 3

Understanding :

	Marks
1. Compare between 'Na' and Na^+ with respect to electronic distribution	2
2. Why Noble gases are non reactive?	2
3. An atom has two electrons more than the inertgas configaration, what type of ion will it form?	1
4. Atomic number of Nitrogen is seven, What is understood by it?	1
	Total 6

Application :

	Marks
1. Which one is more Likely for calcium ion? Ca^+ or Ca^{+2}	1
2. The atomic number of oxygen is eight. How many valence electrons are there?	1
3. A, B, C have atomic number 19, 17, 16 respectively, which one will form cation or anion?	2
	Total 4

Skill :

Show the electronic distribution of Mg by diagram. 2

Example–3

CONTENT ANALYSIS

UNIT : CHEMICAL BONDING　　　　　　　　CLASS–IX

SUBUNITS　　　　　　　　**NUMBER OF PERIODS : 4**

SUBUNIT 1 : Reasons for Combination of Atoms. Element 1.1 : Nature of Noble Gases. Element 1.2 : Duplet and Octet Rule. Element 1.3 : Concept of valence Electrons, Anions and Cations. Element 1.4 : Reasons for combination of Atoms. Element 1.5 : Brief outline of Types of Bonding.	1
SUBUNIT 2 : Electrovalent Compounds. Element 2.1 : Elecrovalency Element 2.2 : Electrovalent Bonding Element 2.3 : Examples Nacl, Cao (Atomic Stricture and Lewis' Structure)	1
SUBUNIT 3 : Covalent Compounds Element 3.1 : Covalency Element 3.2 : Covalent Bonding Element 3.3 : Examples–H_2, O_2, N_2, HCl_2, H_2O, (Atomic and Lewis structure)	1
SUBUNIT 4 : Characteristic Properties of Covalent and Electrovalent Compounds. Element 4.1 : Characteristic Properties of Electrovalent (lonic) and Covalent and Electrovalent Compounds Element 4.2 : Dissimilarities between Covelent and Electrovalent Compounds	1

ANALYSIS OF SUB-UNIT–2

Brief Summary of concepts or matter :

When the atoms belonging to metals and non metals combine to form a molecule, then transfer of electrons takes place from the metallic atom(s) to the non-metallic atom(s). In this way, a cation(s) and an anion(s) are formed. These oppositely charged ions attract each other by strong electrostatic force and come close to each other, forming a molecule. This process of chemical combination is known as Electrovalent (lonic) Bonding and the valency associated with this is known as Electrovalency.

PREVIOUS KNOWLEDGE

It can be expected that the students of class IX should have the following previous knowledge regarding the selected subunit :–

1. Distribution of electrons in respective shells of elements upto calcium.

2. Concept of Noble Gases and its nature.
3. Concept of Duplet and octet Rule.
4. Concept of Valence electrons.
5. Concept of Anions and cations.
6. Reasons for combination of atoms.
7. Brief outline of types of Bonding.

OBJECTIVES

The following behavioural learning outcomes can be expected amongst the Learners due to the Teaching-Learning of the selected subunit :–

COGNITIVE DOMAIN KNOWLEDGE

The students will be able to

(i) Define electrovalency and electrovalent bond.

(ii) Recognise the electrovalent compounds from a mixed bag of Ionic and Covalent Compounds from the atomic structures of few given compounds.

(iii) Label the number of electrovalency on the basis of the valence electrons of atoms.

(iv) Name the ions as cations or anions on the basis of charge present in them.

UNDERSTANDING (COMPREHENSION)

The students will be able to

(i) Identify the atoms forming electrovalent bonds from atomic structure of elements upto calcium.

(ii) Justify the formation of lonic bonding on the basis of the presence of a particular number of valence electrons.

(iii) Illustrate with examples some lonic bonded compounds.

(iv) Explain the nature of ions in a Electrovalent Compound.

APPLICATION

After the completion of the teaching-learning process, the students will be able to

(i) Draw the atomic structure and Lew is structure of compounds forming electrovalent bonds of elements upto Calcium.

(ii) Use the knowledge of ionic bonding to guess the nature of electrovalent bonds.

OTHERS (ANALYSIS)

The students will be able to

(i) Analyse the similarity (if any) and differences between the attraction of atoms and attraction of magnets.

AFFECTIVE DOMAIN

After the completion of the teaching–Learning process, the students will be (able to)

(i) Able to develop the attitude of analysing some commonly available compounds on basis of their properties into Ionic and Non-ionic (covalent) compounds.

(ii) Motivated to draw similar atomic structures of different compounds forming Ionic

Compounds upto Calcium, and thereafter, after Calcium.

(iii) Interested to learn more literatures available on the topic from other resources.

PSYCHOMOTOR DOMAIN (SKILL)

The students will be able to

(i) Draw the atomic structures and Lew is Structures of Ionic Compounds on a very neat manner.

(ii) Make a thermocol or clay (or of any other material) model of the electrovalent compounds.

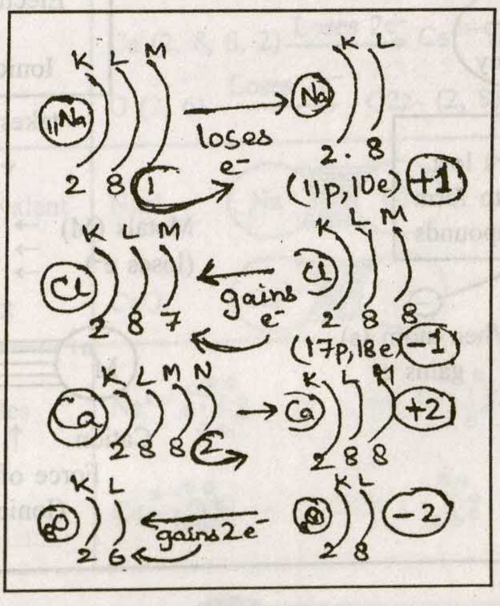
TEACHING STRATEGIES

BROAD METHOD OF TEACHING

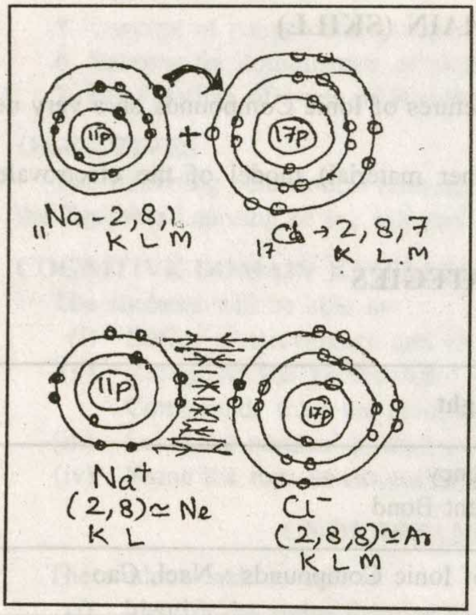
S. No.	Method Followed	Topics Taught
1	Lecture	–Electrovalency –Electrovalent Bond
2	Demonstration	Examples of Ionic Compounds : Nacl, Cao
3	Cooperative Learning	More examples of Electrovalency and Electrovalent Bonds.

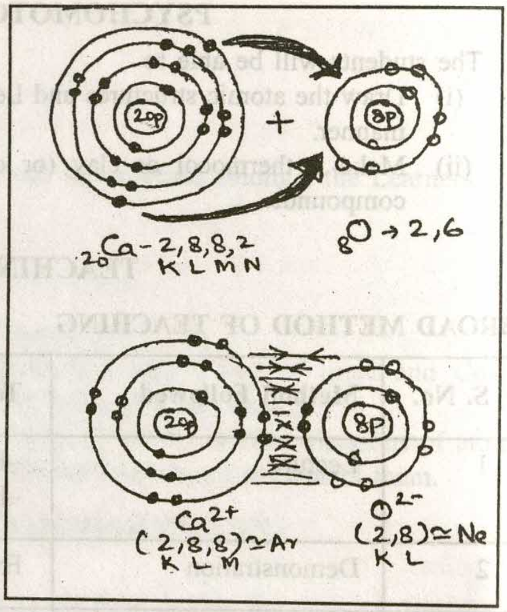
TEACHING LEARNING MATERIALS

1. **Chart (Art Paper) :** Electrovalency of Na, Cl, Ca and O atoms.

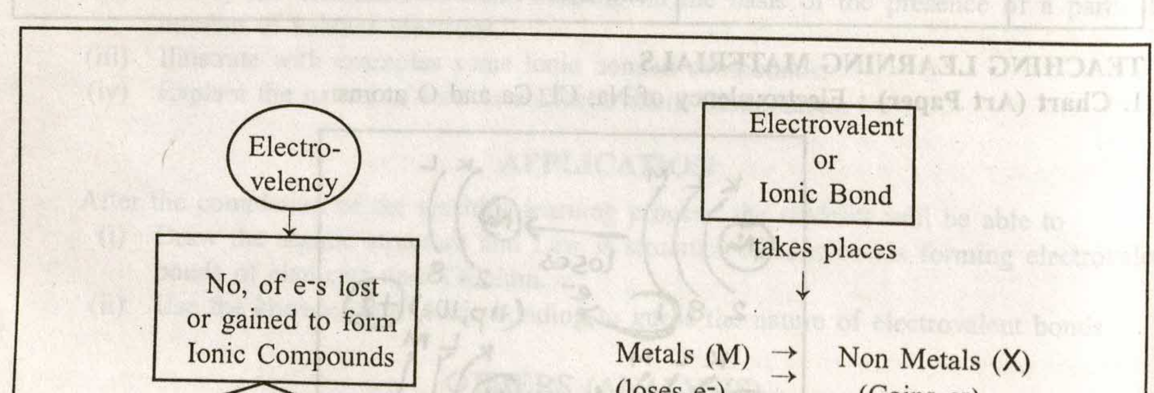


2. Thermocal Models–Atomic structure of Nacl and CaO





USE OF CHALK/WHITE BOARD



Probing questions with brief answers :

Q.1. Why Hydrogen does not form an electrovalent bond when combined with Oxygen to form water, even though it has a valency of +1?

Ans. Hydrogen is not in a position to donate its sole electron to form an electrovalent bond because if it does so, the hydrogen atom will then lose its identity.

Q.2. Why the electrovalency of Oxygen doesnot exceed 2?

Ans. Oxygen has six valence electrons. To fulfill it outer most shell, it needs 2 more electrons, therefore, Oxygen has a maximum valency of two.

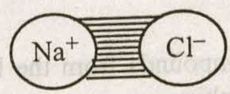
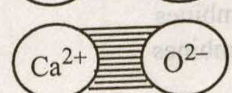
Worksheet :

1. An atom has the electronic distribution of 2, 8, 8, 1. What type of bonding it will form and why?
2. Hydrogen has a valency of +1. It also has a valency of -1. Can you guess when Hydrogen has a valency of -1? Name two such compounds where this type of valency of Hydrogen is observed?
3. Why is sodium ion (Na^{+}) is unreactive but sodium metal is very reactive?

Or

Why sodium metal is kept in Kerosene?

Examples to Illustrate Concepts/Content

Element No.	Concepts	Illustration/Examples
2.1.	Electrovalency	Na(2, 8, 1) $\xrightarrow{\text{loses 1e-}}$ Na^{+} (2, 8) Cl(2, 8, 7) $\xrightarrow{\text{gains 1e}^{-}}$ Cl^{-} (2, 8, 8) Ca (2, 8, 8, 2) $\xrightarrow{\text{Loses 2e}^{-}}$ Ca^{2+} (2, 8, 8) O (2, 6) $\xrightarrow{\text{Loses 2e}^{-}}$ O22– (2, 8)
2.2	Electrovalent Bonding	Nacl  CaO 
2.3	Examples	Na^{x}→ $\overset{\circ\circ}{_{\circ}Cl^{\circ}_{\circ}}$ → Na^{+} [$\overset{x\circ\circ}{_{\circ}Cl^{\circ}_{\circ}}$]$^{-}$ Ca $\overset{x\rightarrow\circ\circ}{_{x\rightarrow}O^{\circ}_{\circ}}$ → Ca2+ [$\overset{x\circ\circ}{_{x}O^{\circ}_{\circ}}$] $^{2-}$

CRITERION REFERENCED TEST

Table of Specification

Sub Unit	K	U	A	S	Total
2.1	1(1)	2(1)	–	–	3(2)
2.2	1(1)	–	4(1)	–	5(2)
2.3	1(1)	4(1)	–	2(1)	7(3)
Percentage of Marks	20%	40%	27%	13%	15(7)

K–TYPE

1. **Fill in the blanks with appropriate answer.**

1.1. The number of valence electrons lost or gained by an atom in the formation of Ionic Compound is known as ——— (1)

1.2 The bond formed by the transfer of electrons is known as ———— (1)

1.3 There is a strong ——— force of attraction formed between Na and Cl ions in a Ionic bond. (1)

U-TYPE

2. State the differences between Ca metal and Ca-ion. (2)
3. Which of the following compounds are electrovalent compounds and why?
   (a) Water (b) Chlorie molecule (c) Lithium Chloride (d) Calcium Fluoride. (4)

A–TYPE

4. A, B, C and D are the four atoms having electronic distribution as
   A = 2, 3
   B = 2, 8, 7
   C = 2, 8, 8
   D = 2, 8, 6

Predict the formula of the compounds from the knowledge of their valency when
   (a) A and B reacts or combines
   (b) A and D reacts or combines
   (c) B and C combines
   (d) C and D combines. (4)

S–TYPE

5. Draw the electron-dot diagram (Lewis structure) for the following compounds.
   (a) Lithium Fluoride
   (b) Aluminium Chloride. (2)

PEDAGOGICAL ANALYSIS IN THE PERSPECTIVE OF MODERN TEACHING STRATEGIES IN SCHOOL SUBJECTS

SUBJECT–MATHEMATICS

Organised by—

INSTITUTE OF ADVANCED STUDIES IN EDUCATION (IASE)

DAVID HARE TRAINING COLLEGE

KOLKATA–700019

Sl. No.	Name of the Participants	Institution
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5.	Bibhas Ranjan Pradhan	Subhas Chandra Basu B. Ed. College– Purba Medinipur
6.	Surpati Pramanik	Nandalal Ghosh B.T. College
7.	Soma Dutta	Shri Shikshayatan College
8.	Chandidas Pal	Fakirchand College B.Ed. Section– Diamand Harbour
9.	Sujata Maiti	Surendralal Das Teachers Training College (B.Ed.)
10.	Nintu Mandal	Shimurali Sachinandan College of Education
11.	Jayati Biswas	Institution of Education–Haldia
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1.	Prof. Bimal Chandra Das	David Hare Training College
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4.	Dr. Hitasish Bhoumick	R. K. M. Sikshanmandira, Belur.
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PEDAGOGICAL ANALYSIS

CONTENT ANALYSIS

Unit (Topic)–বৃত্ত (পরিমিতি) **Class**–IX

Subunit (Subtopic)

SL. No.	Subunit	Nos. of Period
1.	বৃত্তের পরিধি নির্ণয় ও তার প্রয়োগ	2
2.	বৃত্তাকার ক্ষেত্রের ক্ষেত্রফল নির্ণয় ও তার প্রয়োগ	2

ANALYSIS OF SUBUNIT

Subunit–বৃত্তাকার ক্ষেত্রের ক্ষেত্রফল নির্ণয় ও তার প্রয়োগ।

Brief summary of concepts or matter :

একটি r একক ব্যাসার্ধ বিশিষ্ট বৃত্তকে আট ভাগে ভাগ করা হলে প্রত্যেকটি ভাগকে এক একটি বৃত্তকলা বলে। বৃত্তকলাগুলি পরপর সাজিয়ে একটি আয়তক্ষেত্রকার ক্ষেত্র গঠন করা যায় যার দৈর্ঘ্য πr একক ও প্রস্থ r একক।

$\therefore$ আয়তাকার ক্ষেত্রের ক্ষেত্রফল $\pi r.r = \pi r^2$ বর্গএকক যা বৃত্তাকার ক্ষেত্রের ক্ষেত্রফলের সমান

$\therefore$ বৃত্তের ক্ষেত্রফল $= \pi r^2$ বর্গএকক।

কেন্দ্রীয় দুটি বিভিন্ন ব্যাসার্ধ বিশিষ্ট বৃত্তাকার ক্ষেত্রের মধ্যে সাধারণ অংশ বাদ দিলে যে অংশটি অবশিষ্ট থাকে তাকে বলয়াকৃতি অংশ বলে।

ক্ষেত্রফল $= \pi(R^2 - r^2)$ বর্গএকক। R–বড় বৃত্তের ব্যাসার্ধ, r–ছোট বৃত্তের ব্যাসার্ধ।

Previous learning :

শিক্ষার্থীরা বৃত্তের বিভিন্ন অংশ আঁকতে পারে ও চিহ্নিত করতে পারে। বর্গাকার ও আয়তকার ক্ষেত্রের ক্ষেত্রফলের সূত্র বলতে ও লিখতে পারে, π এর আসন্নমান বলতে পারে, বৃত্তের পরিধির সূত্র বলতে ও লিখতে পারে।

Objectives :

1. বৃত্তের সাথে বৃত্তাকার ক্ষেত্রের পার্থক্য করতে পারবে। (U)
2 (a) বৃত্তাকার ক্ষেত্রের ক্ষেত্রফল নির্ণয় করতে পারবে। (U)
   (b) বৃত্তের ক্ষেত্রফলের সূত্র লিখতে পারবে। (K)
3. বৃত্তাকার ক্ষেত্রের ক্ষেত্রফলের সাথে বৃত্তের ব্যাসার্ধ/ব্যাসের সম্পর্ক ব্যাখ্যা করতে পারবে। (U)

4. বৃত্তাকার ক্ষেত্রের ক্ষেত্রফলের একক ও দৈর্ঘ্য-এর এককের সাথে পার্থক্য করতে পারবে। (U)
5. বিভিন্ন বাস্তব সমস্যা সমাধানে বৃত্তাকার ক্ষেত্রের সূত্র প্রয়োগ করতে পারবে। (A)
6. বৃত্তাকার ক্ষেত্রের ক্ষেত্রফল ব্যবহার করে বিভিন্ন নক্সা (Pattern) যেমন— শঙ্কু, লম্ববৃত্তাকার চোঙ গঠণ করে (Construction) ব্যবহার করতে পারবে। (S)
7. বৃত্তাকার ক্ষেত্রের ক্ষেত্রফলের ব্যবহার করে বলয়াকৃতি ক্ষেত্রের ক্ষেত্রফল নির্ণয় করতে পারবে। (U)
8. অন্যান্য সুষম (Regular) সামতলিক চিত্রের সাথে বৃত্তাকার ক্ষেত্রের সম্পর্ক নির্ণয় করতে পারবে। (U)
9. নির্দিষ্ট ক্ষেত্রফল বিশিষ্ট সুষম সামতলিক পাতএর মধ্যে নির্দিষ্ট ব্যাসার্ধ বিশিষ্ট কটি বৃত্তাকার ক্ষেত্র পাওয়া যাবে তা নির্ণয় করতে পারবে। (A)

TEACHING STRATEGIES

Broad method of teaching :

Demonstration পদ্ধতিতে সূত্রটি তৈরী করা হবে।

Experimentation পদ্ধতিতে শিক্ষার্থীরা সূত্রটির সত্যতা যাচাই করবে।

Huristic/Problem solving পদ্ধতিতে শিক্ষার্থীরা সমস্যার সমাধান করবে।

Teaching learning materials–

Model & Chart

Use of chalk board :

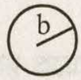
বৃত্তাকার ক্ষেত্রের ক্ষেত্রফলের সূত্র তৈরী করতে ও সূত্রের সাহায্যে সমস্যার সমাধান করার জন্য chalk board এর ব্যবহার করা হবে।

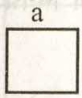
Probing Questions :

1. বৃত্তাকার ক্ষেত্রের ক্ষেত্রফল ও বৃত্তের পরিধির মধ্যে সম্পর্ক কি?
2. কোন বৃত্তের পরিধি c একক দেওয়া থাকলে সেই বৃত্তাকার ক্ষেত্রের ক্ষেত্রফল কত?
3. কোন বৃত্তের (ব্যাসার্ধ Rs) মধ্যকার ক্ষেত্রফলকে এককেন্দ্রীয় অপর একটি ছোট বৃত্ত (ব্যাসার্ধ r) দিয়ে বাদ দিলে যে আকৃতি পাব তার ক্ষেত্রফল কত?

Examples to Illustrate Concepts :

Concept	Example	Non-example
1. বৃত্তের ক্ষেত্রফল	(a)  (b) একটি বৃত্তাকার পাতএর ব্যাসার্ধ 7 মি. হলে ক্ষেত্রফল কত?	
2. বৃত্তের সাথে অন্যান্য সামতলিক চিত্রের তুলনা—	(a) একটি 15 cm বাহু বিশিষ্ট বর্গক্ষেত্র থেকে 2.5 cm ব্যাসার্ধ বিশিষ্ট কটি বৃত্ত পাওয়া যাবে? (b) একটি বৃত্তের ক্ষেত্রফল ও একটি বর্গক্ষেত্রের ক্ষেত্রফল সমান হলে তাদের পরিসীমার অনুপাত নির্ণয় কর।	





CRITERNION REFFERENCED TEST

Table of specifications :

Sub unit \ Objective	K	U	A	S	Marks
1. বৃত্তাকার ক্ষেত্রের ক্ষেত্রফল	1(1)	1(2) 2(1)			5
2. বৃত্তের সাথে অন্যান্য সামতলিক চিত্রের তুলনা		3(1)		3(1)	6
3. বলয়			3(1)		3
Total Marks	1	7	3	3	14

Test items :

1. বৃত্তাকার ক্ষেত্রের ক্ষেত্রফলের সূত্রটি হল——— (K) 1
2. P ব্যাসার্ধ বিশিষ্ট অর্ধবৃত্তাকার ক্ষেত্রের ক্ষেত্রফল হল—
   (a) $\frac{\pi P}{2}$, (b) $\frac{\pi^2 P}{2}$, (c) $\frac{\pi P^2}{2}$, (d) $2\pi P^2$ (U) 1
3. নিম্নলিখিত ক্ষেত্রে কোনটির ক্ষেত্রফল বেশী?
   (a) একটি বৃত্তাকার মাঠের ব্যাসার্ধ 7 cm.
   (b) একটি পুকুরের পরিধি 154 cm.
   (c) একটি বৃত্তাকার পার্কের ব্যাস 16 cm. (U) 2

4. একটি বৃত্তাকার টেবিলের উপরতলের ব্যাস 70 cm. হলে ক্ষেত্রফল 3850 ——. (U) 1

5. 10 মিটার ব্যাসার্ধ বিশিষ্ট একটি বৃত্তাকার বাগানের চারপাশে 4 মিটার চওড়া একটি রাস্তা আছে।

(a) বাগানসহ রাস্তাটির ব্যাসার্ধ কত?

(b) বাগানসহ রাস্তাটির ক্ষেত্রফল কত?

(c) কেবলমাত্র রাস্তাটির ক্ষেত্রফল কত? (A) 3

6. 14 মিটার বাহু বিশিষ্ট একটি বর্গাকার কাঠের বোর্ড দেওয়া হল। যতদূর সম্ভব বড় ক্ষেত্রফল বিশিষ্ট চারটি সমান বৃত্তাকার অংশ কেটে নাও। একটি বৃত্তের ব্যাসার্ধ কত মেপে লেখ। (S) 3

7. কোন ত্রিভুজের পরিসীমা 24 মিটার এবং উহার অন্তর্বৃত্তের পরিধি 44 মিটার হলে ত্রিভুজটির ক্ষেত্রফল নির্ণয় কর। (U) 3

A–Application
S–Skill
K–Knowledge
U–Understanding

TEACHING LEARNING MODULE (TLM) BASED ON PEDAGOGICAL ANALYSIS

Title :

A. Area of a circle (বৃত্তাকার ক্ষেত্রের ক্ষেত্রফল), পরিমিতি।

B. Objectives

বৃত্তের সাথে বৃত্তাকার ক্ষেত্রের পার্থক্য করতে পারবে।

(a) বৃত্তাকার ক্ষেত্রের ক্ষেত্রফল নির্ণয় করতে পারবে।

(b) বৃত্তাকার ক্ষেত্রের ক্ষেত্রফলের সাথে বৃত্তের ব্যাসার্ধ/ব্যাসের সম্পর্ক ব্যাখ্যা করতে পারবে।

(c) পূর্ণ বৃত্তাকার ও অর্দ্ধবৃত্তাকার ক্ষেত্রের ক্ষেত্রফলের মধ্যে সম্পর্ক নির্ণয় করতে পারবে।

(d) বৃত্তাকার ক্ষেত্রের ক্ষেত্রফলের একক ও দৈর্ঘ্য এককের সাথে পার্থক্য করতে পারবে।

(e) বিভিন্ন বাস্তব সমস্যা সমাধানে বৃত্তাকার ক্ষেত্রের সূত্র প্রয়োগ করতে পারবে।

(f) বিভিন্ন নক্সা তৈরী করতে শঙ্কু, লম্ববৃত্তার চোঙ তৈরী (construction) করতে বৃত্তাকার ক্ষেত্রের ক্ষেত্রফল ব্যবহার করতে পারবে।

(g) বৃত্তাকার ক্ষেত্রের ক্ষেত্রফলের ব্যবহার করে বলয়াকৃতিক্ষেত্রের ক্ষেত্রফল নির্ণয় করতে পারবে।

(h) অন্যান্য সুষম (Regular) সামতলিক চিত্রের সাথে বৃত্তাকার ক্ষেত্রের সম্পর্ক নির্ণয় করতে পারবে।

(i) নির্দিষ্ট ক্ষেত্রফল বিশিষ্ট সুষম সামতলিক (ধাতব) পাত হতে নির্দিষ্ট ব্যাসার্ধ বিশিষ্ট কটি বৃত্তাকার ক্ষেত্র পাওয়া যাবে তা নির্ণয় করতে পারবে।

3. **Rationale**–সাধারণত দেখা যায় ছাত্রছাত্রীরা বৃত্ত, বৃত্তাকারক্ষেত্র ও গোলকের মধ্যে সঠিক পার্থক্য করতে না পারায় বাস্তব জীবনে নানা অসুবিধার সম্মুখীন হয়। যেমন বৃত্তাকার পার্কের বেড়া দেওয়ার খরচ ও বৃত্তাকার ক্ষেত্রটিকে পাথরদিয়ে ঢাকতে যা খরচ তা সঠিকভাবে নির্ণয় করতে পারে না। অথবা একটি নির্দিষ্ট মাপের সুষম সামতলিক পাত হতে কয়টি নির্দিষ্ট মাপের বৃত্তাকার ক্ষেত্র বা কয়টি নির্দিষ্ট মাপের বলয় পাওয়া যায় তা নির্ণয়ের ক্ষেত্রে দ্বন্দ্বের সম্মুখীন হয়। এগুলি সম্পর্কে সঠিক ধারণা এবং অন্যান্য সামতলিক ক্ষেত্রের সঙ্গে বৃত্তাকার ক্ষেত্রের সম্পর্ক এবং পার্থক্যের সম্পর্কে সঠিক ধারণা দেওয়ার জন্য অর্থাৎ ব্যবহারিক জ্ঞানের জন্য বিষয়টি ছাত্র-ছাত্রীদের জানা প্রয়োজন।

4. **Overview :**
   (a) সামতলিক চিত্র।
   (b) বাস্তবে কিছু বৃত্ত ও বৃত্তাকারক্ষেত্রের উদাহরণ।
   (c) বৃত্তের সংজ্ঞা।
   (d) বৃত্তের বিভিন্ন অংশ।
   (e) ক্ষেত্রফল নির্ণয়ের ক্ষেত্রে বৃত্তের ব্যাসার্ধের গুরুত্ব।
   (f) বৃত্তের পরিধি সম্পর্কে ধারণা

5. **Pretest :**
   (a) বিভিন্ন সামতলিক চিত্রের নাম দাও।
   (b) আয়তক্ষেত্রের ক্ষেত্রফলের সূত্র লেখ।
   (c) বৃত্ত কাকে বলে?
   (d) কিছু বৃত্ত ও বৃত্তাকার ক্ষেত্রের উদাহরণ দাও।
   (e) বৃত্তের চিত্র অঙ্কণ করে বিভিন্ন অংশ চিহ্নিত কর।

6. বৃত্তের ব্যাস/ব্যাসার্ধকে বাড়ালে বা কমালে বৃত্তাকার ক্ষেত্রের ক্ষেত্রফলের উপর তার প্রভাব কি পড়বে।
7. বৃত্তের পরিধির সূত্র কি?
8. π এর আসন্নমান কত?
9. **Learning activities :**
   প্রথমে Demonstration পদ্ধতিতে সূত্রটি গঠন
   Experimentation সূত্রটির সত্যতা যাচাই করবে
   Problem–solving পদ্ধতিতে সমস্যার সমাধান করবে।

UNIT :– SIMULTANEOUS EQUATIONS Class–IX

Sl. No.	Subunits	No. of periods
1.	Concept of simultaneous equation and solution of a given system of two Simultaneous equations.	1
2.	Solution of simultaneous equations (algebrically)	
	(a) by method of substitution	1
	(b) by method of Comparison	1
	(c) by method of elemination	1
	(d) by method of cross multiplication	1
	(e) by graphical method	1

ANALYSIS OF SUB UNITS

Sub unit : Concept of simultaneous linear equations of two variables and their solution.

Brief Summary of concept or matter : Definition of simultaneous equations in two variables, solution of a given system of two simultaneous equations.

Previous learning : Idea of linear equations with two variables, solution of a linear equation.

Objectives :

Cognitive : knowledge : Students will be able to remember the definition of simultaneous equations and can recall.

Comprehension (Understanding) :

1. Students will be able to differentiate simmultaneous linear equations from linear equations.
2. Students will be able to find error in a fact given in the form of statement.
3. Students will be able to identify the true or false statement.

Application :

1. Students will be able to apply the knowledge of simulteneous equations for equations with fractional coefficients.
2. Students will be able to verify whether a set of given number of x and y satisfy a system of simultaneous equations with all type of coefficients (number, integer, fraction, decimal fraction).

Others (Analysis) :

Affective : (Motivation/Interest/Attitude/Value) :

1. Students will help weaker students to solve the problems.
2. Students will ask the teacher for other reference books.

TEACHING STRATEGIES

Broad method of teaching (e.g. Lecture, Demonstration, Discovery, Experimentation) : Mainly lecture method is used by the teacher.

Teaching Learning materials (Equipment with brief indication of use/software and its use) if any–

Use of chalk/white board : Teacher will write on the black board to make the students understand about simultaneous equations.

Probing questions with brief answers (Thought provoking questions) at least two.

1. Can a system of two simultaneous equations in two variables have more than one solution?

Ans. Yes.

2. What will be the solution of the two simultaneous equations $x+y = 0$ and $x - y = 0$ (By inspection)

Ans. $x + y = 0$, $x - y = 0$

$x = - y$, $x = y$

This is possible only when $x = y = 0$

the solutions are $x = 0$, $y = 0$.

3. Can there be two simultaneous equations in two variables for which no common solution exists

Ans. Yes.

Worksheet (brief description, if any) :

Yet $a_1x + b_1y = c_1$ and $a_2x + b_2y = c_2$ where a, b, c are real numbers ($a \neq 0, b \neq 0$) be a system of two simultaneous linear equations in two variables x and y.

If $x = \alpha$, $y = \beta$ is a solution of the system then $a_1\alpha + b_1\beta = C_1$ and $a_2\alpha + b_2\beta = C_2$ i.e., the solution will satisfy both the equations of the system.

Examples to illustrate concepts/content

Concept/content	Examples
1. **Definition :** Simultaneous linear equations with two variables–Two linar equatins in two unknowns x and y are said to form a system of simultaneous linear equations if each of them is satisfied by the same pair of values of x and y.	The equs. **5x - 3y = 9** and **x + y = 5** form a set of simultaneous linear equations in x and y and $x = 3$, $y = 2$ s atisfy both the equations.

Concept/content	Examples
2. Solution of a given system of simultaneous equations–	1. Show that **x = 6, y = y** is a solution of the system of simultaneous linner equations **x + y = 10** and **x - y =2.** Putting x = 6 and y = 4 in the first equations we get L.H.S. = 6+4 = 10 = RHS and in the 2nd euqation L.H.S. = 6 - 4 = 2 = 1 R.H.S. So, X = 6, y = 4 is a solution of the given system of simultaneous linear equations. 2. Show that x = 3, y = 2 is not a solution of the system of linear equations 3x - 2y = 5 and 2x + y = 7. Putting x = 3, y = 2 in 3x - 2y we get L.H.S = 3.3 – 2.2 = 9 - 4 = 5 = R.H.S. and in 2x + y = 7 we get L.H.S. = 2.3. + 2 = 6 + 2 = 8 ≠ R.H.S. ∴ x = 3, y = 2 is not a solution of the given equation.

Criterion Referenced Test

(Based on objectives cited before)

Table of Specifications : Objectives (Domain), Content (sub unit)

Objective → / ↓ Content (sub unit)	Knowledge	Understanding	Application	Skill	Total
Definition (Simultaneous linear equations in two variables)	1(1)	1(1)	1(2)		3(4)
Solution of (Simultaneous linear equations in two variables)		2(2)	2(4)	3(6)	7(12)
Total	1(1)	3(3)	3(6)	6(10)	= 20

* Numbers in brackets indicate marks.

* Number outside the bracket indicate number of questions.

Test items (Minimum six questions) :

1.1. **Fill in the blanks–**

Two linear equations in two unknowns x and y are said to be ——— if each of them is satisfied by the same values of x and y. (K)

2.1. Write the difference between—

Linear equation and simultaneous linear equations. (U)

2.2. Write correctly the following statement–

The solution of two simultaneous linear equations in two variable are different. (U)

2.3. Write whether the following statement is true or false–

Let $a_1x + b_1y = c_1$ and $a_2x + b_2y = c_2$ be two linear simultaneous equations . If for x $= \alpha$, $y = \beta$, $a_1\alpha + b_1\beta = c_1$ and $a_2\alpha + b_2\beta = c_2$ then $x = \alpha$, $y = \beta$ will not be the solution of the given equations. (U)

3.1. Can $\frac{x}{2}+\frac{y}{3}= 6$ and $\frac{x}{3}-\frac{y}{9} =1$ be a system of simultaneous linear equations? (A)

3.2. Verify whether $x = 2$, $y = 0$ can be a solution of the system of simultaneous linear equations $\cdot 5x+\cdot 2y = 1$ and $\cdot 5x - \cdot 2y = 1$ (A)

3.3. Show that $x = 2$, $y = 1$ is not a solution of the system of linear simultaneous equations $x+2y$ and $3x - 4y =1$ (A)

TEACHING LEARNING MODULE

Title : Concept of simultaneous linar equation of two variables and their solution.

Objectives :

1. Students will be able to differentiate/discriminate simultaneous linear equations in two variables from a linear equations.
2. Students will be able to find error in a fact given in the form of a statement.
3. Students will be able to identify the true or false statement based upon the above mentioned fact.
4. Students will be able to transfer the knowledge for simultaneous equations of two variables with fraction and decimal fraction coefficients.
5. Students will be able to verify whether a set of two given values satisfy the simultaneous linear equations of two variables or not.

Rationals :

After having the lesson, the students will be able to solve different types of problems arising in other subjects such as Physics, Chemistry, Arithmetic etc.

Overview :

This matter contains :

i) Definition of simultaneous linear equation.

ii) Difference between linear equation and simultaneous linear equations.

iii) Solution of simultaneous linear equations.

Pre-test :

1. What is a linear equations?
2. Give an example of a linear equation of one variable?
3. Give an example of a linear equation of two variables?
4. Which of the following equations is not linear with respect to x and y–

   (i) $\frac{2}{x}+\frac{3}{y} = 1$, (ii) $\frac{x}{2}+\frac{y}{5} = 1$, (iii) $2x+3y = 5$, (iv) $x + y = 0$, (v) $\cdot 3x + \cdot 5y = 2$
5. Check whether $x = -1$, $y = 2$ can be a solution of $x+2y = 3$ or not?
6. Show that $x = 3$, $y = 9$ is a solution of $5x - 3y = 9$

Self equation :

Students must have the idea about simultaneous linear equations with two variables and solution of the simultaneous linear equations for self evaluation.

Teachers have to supply all the informations about linear equation, simultaneous linear equations, solutions of simultaneous linear equations and reason for correctness of answers in text form so that students can evaluate themselves.

Learning activities and Instructional alternatives–

Learning activities :

i) Listening.

ii) Interaction with teacher and among themselves.

iii) Solving different types of problems/Answering questions.

Instructional alternatives :

Teacher can give instruction by using

i) Chart

ii) Overhead projection

iii) Power point

Special Students Directions :

i) For gifted students some thought proving problems will be given.

ii) Special care should be taken for backward students.

Resources :

Students can consult different books on Mathematics of suitable level as reference books. They can also get information through **internet.**

Post test :

1. **Fill in the blanks :**
   Two linear equations in two unknowns x and y are said to be ——— if each of them is satisfied by the same values of x and y.
2. Write the difference between–
   Linear equations and simultaneous linear equation.
3. Write correctly the following statement–
   The solution of two simultaneous linear equation in two variables are different.
4. Write whether the following statement is true or false–
   Let $a_1x + b_1y = c_1$ and $a_2x + b_2y = c_2$ be two linear simultaneous equations, If for $x = \alpha$ and $y = \beta$, $a_1\alpha + b_1\beta = c_1$ and $a_2\alpha + b_2\beta = c_2$ then $x = \alpha$, $y = \beta$, will not be the solutionof the given equations.
5. Can $\frac{x}{2} + \frac{y}{3} = 6$ and $\frac{x}{3} - \frac{y}{9} = 1$ be a system of simultaneous linear equations?
6. Verify whether $x = 2$, $y = 0$ can be a solution of the system by simultaneous linear equations $\cdot 5x + \cdot 2y = 1$ and $\cdot 5x = \cdot 2y = 1$
7. Can a system of two simultaneous linear equations in two variables have more than one solution?
8. Can there be two simultaneous equations in two variables which do not have common solution?
9. Find the solution of the two simultenous equations $x+y = 0$ and $x - y = 0$.

Teacher's instruction :

Teacher can give geometrical interpretation of linear equation and solution of a linear equation and simultaneous linear equations.

Sub : Mathematics
Lesson : Algebra

CONTENT ANALYSIS

Unit : Solution of Simultoneous Equations.
Sub-units :

Sl. No.	Content	No. of period
1.	Concept & construction of linear second order & 1st degree equation.	1
2.	Solution by Comparison Method	1
3.	Solution by Method of Elimination	1
4.	Solution by Method of Substitution	1
5.	Solution by Method of Cross multiplication	1
6.	Solution by Graphical Method	1
7.	Consistency/Inconsistency of the solution	1
		Total 7

ANALYSIS OF SUB UNITS

Sub unit : Solution by Method of substitution

Brief summary of Concept/Matter :

Seperation of variables, one variable can be replaced by the other variable between the two system of linear equations when one variable is solved, the other can be found from the substitution in another equation.

Previous Learning :

Knowledge :

Concept of solution of one variable equation.

Conversion from left to right with their sign change.

Content :

Formation of one variable linear equation.

Identification of variable & its nature.

Comprehensive :

Identify variables.

Seperate variable.

Take help from the teacher if necessary.

Objectives :

Cognitive :

Knowledge : First to identify the variables, seperate the variables & then replace one with the other.

Comprehensive :

Separating the variables it is to be understood that how to put one variable in place of another variable & then ready to solve. $xy = y + 2; 3xy = 5+3y$

Application :

Understanding the solution of two variable linear equation, it can be used farther in the other branches of mathematics say Arithmetic, Geometry, Mensuration, Co-ordinate geometry etc.

e.g. 2 pencil & 3 pen costing the sum Rs. 27 & 3 pencil & 2 pen costing the sum Rs. 24 Find the cost of each Pen & Pencil.

Others (Analysis) :

The variable (x & y) are critically analysed & try to apply in the another field of subjects other than mathematics eg. 1. $y = mx + c$, $a_1x + b_1y = d$

2. $px + qx = r$, $\frac{p}{a} = \frac{q}{b}$

Affective Motivation :

Learning the language of the problem & using the knowledge over the simultaneous equations the concentration is to be done eg. $\frac{x-a}{a} = \frac{y-b}{b} = \frac{x+y-c}{c}$

Interest :

When once motivation is grown the interest will autometically come in his/her mind to solve the problem quickly eg. $\frac{p}{x} = \frac{q}{y}$, $\frac{x-a}{a} = \frac{y-b}{b}$.

Attitude :

The attitude will be how to make a concrete & correct solution of the variables in the simultaneous equations.

e.g. $a(x+y) = b(x-y)$

$a(x-y) = b(x+y)$

Value :

The correctness of the solution will give the high value of the objectives

eg. $ax - by = c$, $bx + ay = d$

Skill :

If the solution is made in one chance without any difficulties in the process of solution/ seperation/substitution of the variables, then the skill will be much better.

eg. $2x+1 = 3y-2$

$3y+2x = 3$

BROAD METHOD OF TEACHING

Lecture :

In this part, the problems are to be presented before the students clearly & reasonably.

Domonstration :

Arrangement of equation variables & their separation & substitution are to be done through some instruction/demonstration.

eg. $1+5x = 3-2y$

$-6+7y = 2x+1$

Discovery :

Keeping in mind the goal & purpose of the solution of simutaneous equation the students may creat & solve a series of simultaneous equations.

$$\frac{x-y}{a} = \frac{x+y}{b} = \frac{a+b}{ab}$$

Teaching learning Materials :

Black/white board, graph board, charts/models co-incident lines, parallel & intersected lines. In some cases microsoft power point & software may be used.

Use of chak :

Board work is the main device to solve the simultaneous equation.

Probing Questions :

Solve the simultaneous equation.

(i) x = y, y = -x, (ii) y = 2x+7, y = 2x+3, (iii) Construct the simultaneous equation given structure & then solve $\begin{pmatrix}4 & 3\\1 & 5\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix} = \begin{pmatrix}8\\7\end{pmatrix}$

In addition to that can you put them in the graph board?

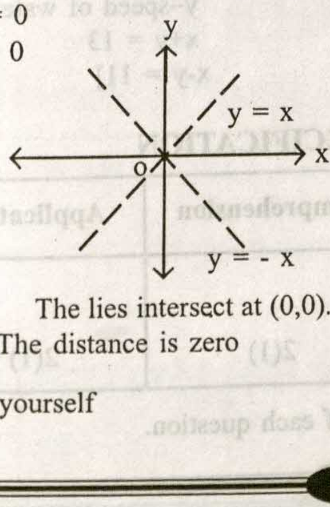
If so, can you measure the distance between them at their solution pt.?

Hints : (i) $y = x = -x$

or $2x = 0$

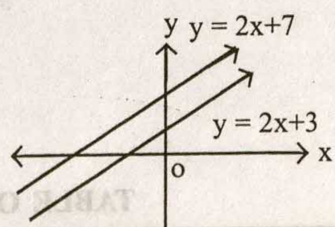
$x = 0$

$\therefore \quad y = 0$



The lies intersect at (0,0).
The distance is zero

(ii)



The lines never intersect each other, so substitution can not be made & hence they have no solution

(iii) Try yourself

Worksheet :

Solve the following simultaneous equation by the method of substitution.

(i) $\frac{2}{x}+\frac{1}{y} = 3$......... (1)

$x = y$ .... (2)

(ii) $\sqrt{3}x - y = 2$ ....(1)

$x - \sqrt{3}y = 2$ ....(2)

(iii) $3x = 5y + 2$............(1)

$y = -\frac{2}{5}$ ....(2)

Examples to illustrate concepts/content

Concept/content	Examples
1. Number system positive/negative integers/Frictional irratimal etc.	1. The sum of two numbers is O, but the difference of their reciprocal is $\frac{1}{2}$. Find the two numbers **[Hints :** $x + y = 0$ $\frac{1}{x} - \frac{1}{y} = \frac{1}{2}$]
2. Calculation of Age weight, height etc.	2. The present age of father is 4 times his son. Five years ago, it was 7 times. Find the present age of son & father **[Hints :** Son–x $y = 4x$ Father–y $7(x-5) = y-5$]
3. Speed, profit-loss, time, distance etc.	3. The speed of a boat towards the current is 13 Km/hr. & that against the current is 11 Km./hr. Find the speed the boat in still water & water **[Hint :** x–Speed of boat in still water y–speed of water current $x+y = 13$ $x-y = 11$]

TABLE OF SPECIFICATION

Sub unit	knowledge	comprehension	Application	Total
Solution of simultanous equation by method of substitution	2(1)	2(1)	2(1)	6

Note : Number in the bracket indicates marks of each question.

Number outside the bracket indicates no. of question in each item.

Test Items :

Knowledge base–(i) $3x+3y = \frac{1}{3}$ (ii) $\sqrt{5}x - y = 1$

$3x - 3y = 3$ $x + \sqrt{5}y = 5$

Comprehensive base–(i) $3x-8y = 5xy$

$4x+7y = 3xy$

(ii) $(x-1)(y+5) = (x-5)(y-3)$

$\frac{x - a}{y - b} = \frac{x - c}{y - d}$

Application base–(i) A train passes a man in 17 sec. & that a platform in 22 Sec. Find the length of the platform & the speed.

(ii) If the sum of digits of two digit number is 8 & when they interchange their position the number inereased by 18. Find the number

পাঠ একক বিশ্লেষন (CONTENT ANALYSIS)

বিষয় (Subject)–গণিত (জ্যামিতি), শ্রেণী (Class)–নবম

একক (Unit)—ক্ষেত্রফল সংক্রান্ত উপপাদ্য

উপ একক (Sub unit)	পিরিয়ড সংখ্যা (No. of periods) (40 minute/period)
1. যে সকল সামান্তরিক একই ভূমি ও একই সমান্তরাল যুগলের মধ্যে অবস্থিত তাদের ক্ষেত্রফল সমান। (i) সামান্তরিক, সমান্তরাল সরলরেখা এবং একান্তর ও অনুরূপ কোণ সম্বন্ধে ধারণা (ii) উপপাদ্যের প্রতিষ্ঠা। (iii) উপপাদ্য সংক্রান্ত সমস্যার সমাধান।	2
2. কোনো ত্রিভুজ এবং কোনো সামান্তরিক একই ভূমি ও একই সমান্তরাল যুগলের মধ্যে অবস্থিত হলে ত্রিভুজের ক্ষেত্রফল সামান্তরিকের ক্ষেত্রফলের অর্ধেক হবে।	2
3. একই ভূমি এবং একই সমান্তরাল যুগলের মধ্যে অবস্থিত দুটি ত্রিভুজের ক্ষেত্রফল সমান।	2
4. সমান সমান ক্ষেত্রফল বিশিষ্ট ত্রিভুজগুলি একই ভূমির উপর এবং ভূমির একই পার্শ্বে অবস্থিত হলে তারা একই সমান্তরাল যুগলের মধ্যে অবস্থিত হবে।	2
	মোট পিরিয়ড সংখ্যা = 8

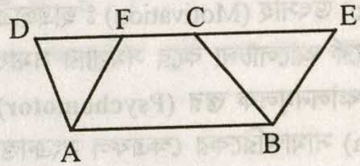
উপ এককের বিশ্লেষণ (Analysis of the Sub unit)

উপ একক (Sub unit) ঃ যে সকল সামন্তরিক একই ভূমি ও একই সমান্তরাল যুগলের মধ্যে অবস্থিত তাদের ক্ষেত্রফল সমান।

(—উপপাদ্যটির প্রতিষ্ঠা।)

বিষয়বস্তুর সংক্ষিপ্ত বিবরণ (Brief Summary of concept or matter) ঃ

যে সকল সামান্তরিক একই ভূমি ও একই সমান্তরাল যুগলের মধ্যে অবস্থিত তাদের ক্ষেত্রফল সমান—উপপাদ্যটির পরীক্ষামূলক এবং জ্যামিতিক প্রমাণ। প্রয়োজনীয় চিত্র—



পূর্বার্জিত জ্ঞান (Previous learning)

(1) অনুরূপ কোন, একান্তর কোণ চিহ্নিত করতে জানে।

(2) সামান্তরিকের ধর্মগুলি জানে।

(3) ত্রিভুজের ও সামন্তরিকের ক্ষেত্রফলের সূত্র জানে।

(Objectives) উদ্দেশ্য ঃ

1. **বৌদ্ধিক স্তর (Cognitive)**

(a) **জ্ঞানমূলক (Knowledge) ঃ**

(i) দুটি সামান্তরিক যখন একই ভূমি এক একই সমান্তরাল যুগলের মধ্যে থাকে তাদের ক্ষেত্রফলের তুলনা করতে পারবে।

(ii) একই ভূমির উপর অবস্থিত দুটি ত্রিভুজের ক্ষেত্রফল কখন সমান হবে তা বলতে পারবে।

(b) **বোধমূলক (Comprehension) :**

(i) দুটি সমান ক্ষেত্রফল বিশিষ্ট চিত্রের প্রত্যেকটির থেকে একটি চিত্রের ক্ষেত্রফল যোগ বা বিয়োগ করলে যোগফল বা বিয়োগফল সমান হবে—তথ্যটি ব্যাখ্যা করতে পারবে।

(ii) সামান্তরিক ও ত্রিভুজের ক্ষেত্রফলের পার্থক্য নির্ণয় করতে পারবে।

(c) প্রয়োগমূলক (Application) ঃ

(1) উপপাদ্যটির প্রয়োগ করে একটি আয়তক্ষেত্র এবং একটি সামান্তরিক একই ভূমি এবং একই সমান্তরাল যুগলের মধ্যে অবস্থিত হলে তাদের ক্ষেত্র ফল সমান হবে তা প্রমাণ করতে পারবে।

(d) অন্যান্য (Others) ঃ

(i) **বিশ্লেষণ (Analysis) ঃ**

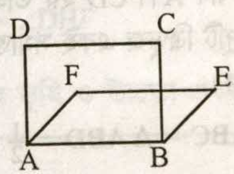
(a) দুটি সমান ক্ষেত্রফল বিশিষ্ট সামান্তরিক একই ভূমি এবং একই সমান্তরাল যুগলের মধ্যে অবস্থিত হবে তা প্রমান করতে পারবে।

(ii) **সংশ্লেষণ (Synthesis) ঃ**

(a) একই ভূমি ও একই সমান্তরাল যুগলের মধ্যে অবস্থিত সামান্তরিকগুলির ক্ষেত্রফল সমান হবে তা ব্যাখ্যাসহ প্রমাণ করতে পারবে।

(ii) **মূল্যায়ন (Evaluation) ঃ**

(a) ABCD বর্গক্ষেত্রের ক্ষেত্রফল ABEF রম্বসের চেয়ে বেশী তা প্রমাণ করতে সক্ষম হবে।



2. **অনুভূতিমূলক স্তর (Affective) :**

(a) আগ্রহ (Interest) ঃ বিভিন্ন সামান্তরিকের ক্ষেত্রফলের মধ্যে সম্পর্ক স্থাপনে আগ্রহী হবে।

(b) মনোভাব (Attitude) ঃ সামান্তরিকের ক্ষেত্রফল সংক্রান্ত সমস্যার সমাধানের মনোভাব গড়ে উঠবে।

(c) উৎসাহ (Motivation) ঃ ছাত্রছাত্রীরা প্রশ্নোত্তরের মাধ্যমে বিভিন্ন সামান্তরিকের ভূমির অবস্থান ও উচ্চতা সম্পর্কে আলোচনা করে সমস্যার সমাধানে উৎসাহিত হয়ে উঠবে।

3. **সঞ্চালনমূলক স্তর (Psychomotor)—**

(a) সামান্তরিকের ক্ষেত্রফল সংক্রান্ত যে কোন সমস্যা চিত্র অঙ্কন করে সমাধান করতে পারবে।

শিক্ষণ পদ্ধতি সমূহ (Broad Methods of teaching)

(i) **বক্তৃতা** (Lecture)—শিক্ষক/শিক্ষিকা জ্ঞাত তথ্যগুলি বিবৃত করবেন। প্রয়োজনীয় চিত্র অঙ্কন করতেন এবং জ্যামিতিক পদ্ধতিতে উপপাদ্যটির সত্যতা বক্তৃতার মাধ্যমে প্রতিষ্ঠা করবেন।

(ii) **প্রতিপাদন (Demonstration)**–বিভিন্ন সামান্তরিকের নমুনা দ্বারা একই ভূমি এবং একই সমান্তরাল যুগলের মধ্যে বসিয়ে দেখাবেন তাদের ক্ষেত্রফল সমান এবং সমান ক্ষেত্রফল বিশিষ্ট সামান্তরিকগুলিকে একই ভূমি এবং একই সামান্তরিক যুগলের মধ্যে স্থাপন করবেন।

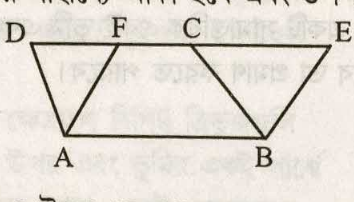
(iv) **আবিস্কার (Discovery)**—শিক্ষার্থীরা থার্মোকল দিয়ে একই ভূমি এবং একই উচ্চতা বিশিষ্ট সামান্তরিক বানিয়ে তাদের ক্ষেত্রফল সমান দেখাতে চেষ্টা করবে।

উপকরণ সমূহ (Teaching learning material) :

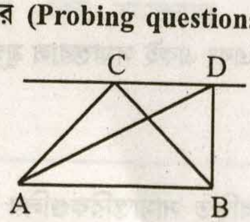
(1) চার্ট—অনুরূপ কোণ, সর্বসম ত্রিভুজ এবং উপপাদ্যের প্রমাণ সংক্রান্ত চিত্রের একটি চার্ট।

(2) মডেল—থার্মোকল নির্মিত সামান্তরিকের মডেল।

চক ও রাইটিং বোর্ডের ব্যবহার (Use of chalk and writing board) ঃ উপপাদ্যটির প্রমান সংক্রান্ত চিত্রটি বিভিন্ন রংএর চকের সাহায্যে আঁকা হবে এবং উপপাদ্যটির প্রমান করা হবে।



অনুসন্ধানী প্রশ্ন ও উত্তর (Probing questions with brief answers) ঃ

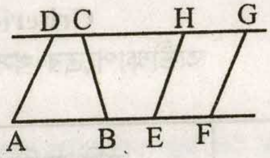


(1) যদি A।। CD হয় তাহলে ΔABC এবং Δ ABD এর ক্ষেত্রফল কি সমান? কারণ কি?

উঃ দুটি ত্রিভুজ একই সমান্তরাল যুগলের মধ্যে অবস্থিত। সুতরাং এদের উচ্চতা একই। এবং দুটি ত্রিভুজের ভূমি AB।

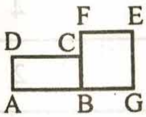
$\therefore$ ABC = Δ ABD = $\frac{1}{2}$ x AB x উচ্চতা।

(ii) যদি AF ।। DG হয় তাহলে ABCD ও EFGF এর ক্ষেত্রফল কি সমান হবে?

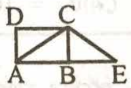


3. যদিও ক্ষেত্রদুটি একই সমান্তরাল যুগলের মধ্যে অবস্থিত কিন্তু ক্ষেত্রদুটির ভূমি এক নয়। সুতরাং ক্ষেত্রদুটির ক্ষেত্রফল সমান নয়।

কাজের পত্র **(Work Sheet)** ঃ

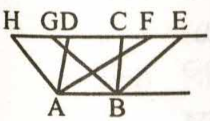


□ABCD এর ক্ষেত্রফল □BGEF এর ক্ষেত্রফল (=, ≠)



B যদি AE এর মধ্যবিন্দু হয়।

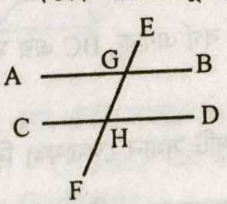
□ABCD ক্ষেত্রফল = —— ΔAEC ক্ষেত্রফল।



□ABCD এর ক্ষেত্রফল, □ABEF এর ক্ষেত্রফল এবং □ABGH এর ক্ষেত্রফল—— ।

বিষয়বস্তুর ধারণা ও উদাহরণ

(Examples to illustrate concept)

ধারণা	উদাহরণ
(i) ক্ষেত্রফল	(1) টেবিলের উপর একটি বই রেখে শিক্ষিকা দেখাবেন বইটি যতটা জায়গা জুড়ে রয়েছে সেটি বইটির ক্ষেত্রফল।
(ii) অনুরূপ কোণ	 $\angle AGE = \angle CHG$ $\angle EGB = \angle GHD$ $\angle AGF = \angle CHF$ $\angle BGH = \angle DHF$
(iii) উপপাদ্যটির প্রতিষ্ঠা	বিভিন্ন সামান্তরিক যাদের ভূমি ও উচ্চতা একই।

Criterion Referenced Test

অভীক্ষাপত্রের খসড়া (Table of Specification)

উদ্দেশ্য	অতি সংক্ষিপ্ত উত্তরধর্মী	সংক্ষিপ্ত উত্তরধর্মী	রচনাধর্মী	মোট নম্বর
জ্ঞান	2(1)			2
বোধ	2(1)	1(2)		4
প্রয়োগ		1(2)		2
দক্ষতা		1(2)		2
				মোট = 10

x(y) x = প্রশ্নের সংখ্যা

y = প্রতিটি প্রশ্নের মূল্যমান

অভীক্ষা পত্র

(1) কি শর্তে দুটি সামন্তরিকের ক্ষেত্রফল সমান হবে? (জ্ঞান)

(2) একই ভূমি ও একই সমান্তরাল যুগলের মধ্যে অবস্থিত একটি ত্রিভূজ ও একটি সামান্তরিকের ক্ষেত্রফলের অনুপাত ——— হবে। (বোধ)

(3) একটি আয়তক্ষেত্র ও একটি সামান্তরিক একই ভূমি ও সমান্তরাল যুগলের মধ্যে অবস্থিত হলে তাদের ক্ষেত্রফল সমান হবে। (প্রয়োগ)

(4) ABCD সামান্তরিকের AC কর্ণের উপর O যে কোন একটি বিন্দু। O বিন্দু দিয়ে অঙ্কিত AB এর সমান্তরাল সরলরেখা AD ও BC যথাক্রমে E ও F বিন্দুতে ছেদ করেছে এবং O বিন্দু দিয়ে অঙ্কিত AD এর সমান্তরাল সরলরেখা AB ও DC কে যথাক্রমে G ও H বিন্দুতে ছেদ করেছে—চিত্রটি অঙ্কন কর। (দক্ষতা)

(5) ABCD সামান্তরিখের ক্ষেত্রফল 10 বর্গ একক, BC এর মধ্যবিন্দু P হলে ΔABP এর ক্ষেত্রফল কত? (প্রয়োগ)।

(6) কোন ত্রিভুজের —— ত্রিভুজটিকে দুটি সমান ক্ষেত্রফল বিশিষ্ট ত্রিভুজে ভাগ করে। (বোধ)

(7) একই ভূমি বিশিষ্ট একটি ত্রিভুজের ক্ষেত্রফল একটি সামান্তরিকের ক্ষেত্রফলের অর্ধেক হলে তাদের —— সমান হবে। (জ্ঞান)

Title–ক্ষেত্রফল সংক্রান্ত উপপাদ্য

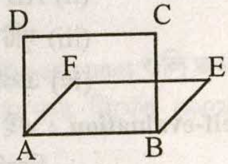
Objectives : (i) দুটি সামান্তরিক যখন একই ভূমি এবং একই সমান্তরাল যুগলের মধ্যে থাকে তাদের ক্ষেত্রফলের তুলনা করতে পারবে। (জ্ঞান)

(ii) দুটি সমান ক্ষেত্রফল বিশিষ্ট চিত্রের প্রত্যেকটির থেকে একটি চিত্রের ক্ষেত্রফল যোগ বা বিয়োগ করলে যোগফল বা বিয়োগফল সমান হবে। এই তথ্যটি বাখ্যা করতে পারবে। (বোধ)

(iii) উপপাদ্যটির প্রয়োগ করে একটি আয়তক্ষেত্র এবং একটি সামান্তরিক একই ভূমি এবং একই সমান্তরাল যুগলের মধ্যে অবস্থিত হলে তাদের ক্ষেত্রফল সমান হবে তা প্রমান করতে পারবে। (প্রয়োগ)

(iv) দুটি সমান ক্ষেত্রফল বিশিষ্ট সামান্তরিক একই ভূমি এবং একই সমান্তরাল যুগলের মধ্যে অবস্থিত হবে তা প্রমাণ করতে পারবে। (বিশ্লেষণ)

(v) একই ভূমি এবং একই সমান্তরাল যুগলের মধ্যে অবস্থিত সামান্তরিক গুলির ক্ষেত্রফল সমান হবে তা ব্যাখ্যা সহ প্রমাণ করতে পারবে। (সংশ্লেষণ)



(vi) ABCD বর্গক্ষেত্রের ক্ষেত্রফল, ABEF রম্বসের ক্ষেত্রফলের চেয়ে বেশী হবে তা প্রমান করতে পারবে। (মূল্যায়ন)

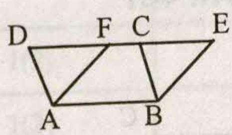
(vii) বিভিন্ন সামান্তরিকের ক্ষেত্রফলের মধ্যে সম্পর্ক স্থাপনে আগ্রহী হবে। (অনুভূতিমূলক স্তর)

(viii) সামান্তরিকের ক্ষেত্রফল সংক্রান্ত যে কোন সমস্যা চিত্র অঙ্কন করে সমাধান করতে পারবে। (সঞ্চালনমূলক স্তর)।

Rationale : এই মডিউলটি উচ্চশিক্ষার ক্ষেত্রে এবং বাস্তব জীবনে ক্ষেত্রফল সংক্রান্ত বিভিন্ন ধরনের সমস্যার সমাধানে শিক্ষার্থীদের সহায়তা করবে।

Overview : যে সকল সামান্তরিক একই ভূমি ও একই সমান্তরাল যুগলের মধ্যে অবস্থিত তাদের ক্ষেত্রফল সমান।

প্রয়োজনীয় চিত্র ঃ



□ ABCD এবং □ ABEF একই ভূমি AB এবং একই সমান্তরাল যুগলের AB ও DE এর মধ্যে অবস্থিত।

প্রমান করতে হবে□ ABCD এর ক্ষেত্রফল = □ ABEF এর ক্ষেত্রফল।

প্রমাণ ঃ ABCD সামান্তরিকের AB ও BC বিপরীতবাহু।

AD ॥ BC, DE ভেদক

$\therefore \angle BCE$ = অনুরূপ $\angle ADF$

আবার □ ABEF এর ক্ষেত্রে AF ও BE বিপরীত বাহু

AF ।। BE এবং DE ভেদক

∴ ∠ BEC = অনুরূপ ∠ AFD

এবার Δ BEG এবং ΔAFD এর

∠BCE = ∠ ADF (প্রমাণিত)

∠BEC = ∠AFD (প্রমাণিত)

BE = AF (□ এর বিপরীত বাহু)

Δ BEC ≅ Δ AFD (কোণ—বাহু—কোণ শর্তানুসারে)

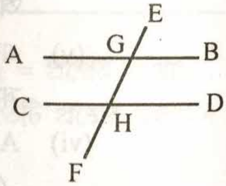
∴ চতুর্ভুজ ABED – Δ BEC = চতুর্ভূজ ABED – Δ AFD

∴□ABCD = □ABEF

Pre test : মডিউলটি পাঠের পূর্বে শিক্ষার্থীদের নিম্নলিখিত বিষয়গুলির ধারনা থাকবে এবং প্রশ্নগুলির উত্তর দিতে সক্ষম হবে।

(i) বর্গক্ষেত্রের একটি বাহু a একক হলে বর্গ ক্ষেত্রের ক্ষেত্রফল কত?

(ii) AB ।। CD, EF ভেদক হলে অনুরূপ কোণগুলি চিহ্নিত কর।



(iii) দুটি ত্রিভুজকে কখন সর্বসম বলা যাবে?

(iv) একটি চতুর্ভূজকে কখন সামন্তরিক বলা হবে?

Self-evaluation : এই মডিউলটির উদ্দেশ্য শিক্ষার্থীরা অর্জন করতে পেরেছে কিনা তা জানার জন্য নিম্নলিখিত প্রশ্নগুলি করা হবে।

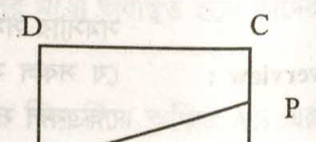
(1) কি শর্তে দুটি সামন্তরিকের ক্ষেত্রফল সমান হবে?

উঃ সামন্তরিক দুটি একই ভূমি এবং একই সমান্তরাল যুগলের মধ্যে অবস্থিত হলে।

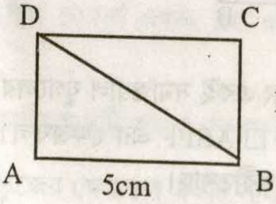
(2) একই ভূমি এবং একই সমান্তরাল যুগলের মধ্যে অবস্থিত একটি ত্রিভূজ ও একটি সামন্তরিকের ক্ষেত্রফলের অনুপাত কত হবে?

উঃ $\frac{1}{2}$

(3) ABCD সামান্তরিকের ক্ষেত্রফল 10 বর্গএকক। BC এর মধ্যবিন্দু P হলে ΔABP এর ক্ষেত্রফল কত?



উঃ 2.5 বর্গএকক।

(4) 

P AB = 5cm. ΔABD এর উচ্চতা 4cm হলে □ABCD এর ক্ষেত্রফল কত?

উঃ 20 বর্গ সে. মি.

7. Learning Activities and Instructional alternatives :–এই মডিউলটি পাঠের ক্ষেত্রে শিক্ষার্থীরা পরীক্ষা পদ্ধতি এবং আবিস্কারের পদ্ধতি প্রয়োগ করবে।

(I) পরীক্ষা পদ্ধতি—বিভিন্ন সামান্তরিকের নমুনা নিয়ে একই ভূমি এবং একই সমান্তরাল যুগলের মধ্যে বসিয়ে দেখবে তাদের ক্ষেত্রফল সমান কিনা এবং সমান ক্ষেত্রফল বিশিষ্ট সামান্তরিক গুলিকে একইভূমি এবং একই সমান্তরাল যুগলের মধ্যে স্থাপন করার চেষ্টা করবে।

(II) আবিষ্কারক পদ্ধতি—শিক্ষার্থীরা থার্মোকল দিয়ে একই ভূমি এবং একই উচ্চতা বিশিষ্ট সামান্তরিক বানিয়ে তাদের ক্ষেত্রফল সমান দেখাত চেষ্টা করবে।

Teaching learning material

(I) শিক্ষার্থীরা অনুরূপ কোন, সর্বময় ত্রিভুজ এবং উপপাদ্যের প্রমাণ, সংক্রান্ত চিত্রের একটি চার্ট।

(II) থার্মোকল নির্মিত সামন্তরিকের মডেল।

7. Special students direction : (I) পিছিয়ে পড়া ছাত্রছাত্রীদের ক্ষেত্রে প্রাথমিক ধারণা গুলি সম্বন্ধে বিস্তারিতভাবে মডিউলে বলা থাকবে। উপপাদ্যের প্রমাণ সংক্রান্ত চার্ট ব্যবহার করতে হবে। তাদের মনোযোগ আকর্যনের জন্য বিভিন্ন রং ও আকারের সামান্তরিক তৈরী করতে বলা হবে।

(II) উন্নত বুদ্ধি সম্পন্ন ছাত্র ছাত্রীদের ক্ষেত্রে মডিউলের মধ্যে উপপাদ্যের প্রয়োগ সংক্রান্ত জটিল সমস্যা সমাধান করতে দেওয়া হবে।

9. Resources : শিক্ষার্থীদের পাঠ্য বই, বিভিন্ন সহায়ক গ্রন্থ পাঠ করতে বলা হবে। শিক্ষা সংক্রান্ত website-এ উপপাদ্য সংক্রান্ত জ্যামিতিক তথ্য দেখতে বলা হবে।

10. **General classroom Management Procedure :** বিষয় শিক্ষকের কাছে assignnet গুলি জমা দেবে। এবং উপকরণগুলো কিভাবে শিক্ষার্থীরা তৈরী করবে মডিউলের তার নির্দেশ দেওয়া থাকবে।

11. **Post test**

অভীক্ষা পত্রের সমতা

	অতি সংক্ষিপ্ত উত্তরধর্মী	সংক্ষিপ্ত	রচনাধর্মী	পূর্ণমান
জ্ঞান	2(1)			2
বোধ	2(1)	1(2)		4
প্রয়োগ		1(2)		2
দক্ষতা		1(2)		2
				মোটনম্বর = 10

x(y) x = প্রশ্নের সংখ্যা

y = প্রতিটি প্রশ্নের মূল্যমান।

অতিসংক্ষিপ্ত অভীক্ষাপত্র

(i) কি শর্তে দুটি সামান্তরিকের ক্ষেত্রফল সমান হবে? (জ্ঞান)

(ii) একই ভূমি ও একই সমান্তরাল যুগলের মধ্যে অবস্থিত একটি ত্রিভুজ ও একটি সামান্তরিকের ক্ষেত্রফলের অনুপাত ——— হবে। (বোধ)

(iii) একই ভূমি বিশিষ্ট একটি ত্রিভূজের ক্ষেত্রফল একটি সামান্তরিকের ক্ষেত্রফলের অর্ধেক হলে তাদের ——— সমান হবে। (জ্ঞান)

(iv) কোনো ত্রিভুজের ——— ত্রিভুজটিকে দুটি সমান ক্ষেত্রফল বিশিষ্ট ত্রিভুজে ভাগ করবে। (বোধ)

সংক্ষিপ্ত উত্তরধর্মী

(v) একটি আয়তক্ষেত্র ও একটি সামান্তরিক একই ভূমি ও সমান্তরাল যুগলের মধ্যে অবস্থিত হলে তাদের ক্ষেত্রফল সমান হবে। (প্রয়োগ)

(vi) ABCD সামন্তরিকের ক্ষেত্রফল 10 বর্গএকক। BC এর মধ্যবিন্দু P হলে ΔABP এর ক্ষেত্রফল কত? (প্রয়োগ)

(vii) ABCD সামান্তরিকের AC কর্ণের উপর O যে কোন একটি বিন্দু। O বিন্দু দিয়ে AB এর সমান্তরাল সরলরেখা AD ও BC কে যথাক্রমে E ও F বিন্দুতে ছেদ করেছে। এবং O বিন্দু দিয়ে অঙ্কিত AD এর সমান্তরাল সরলরেখা AB ও DC কে যথাক্রমে G ও H বিন্দুতে ছেদ করেছে—চিত্রটি অঙ্কন কর। (দক্ষতা)

12. Teachers' Instruction : ঃ শিক্ষক বক্তৃতা পদ্ধতি, প্রতিপাদন পদ্ধতি, আবিস্কারক পদ্ধতি ও পরীক্ষামূলক পদ্ধতির সাহায্য নেবেন। পিছিয়ে পড়া ছাত্র-ছাত্রীদের জন্য অতিরিক্ত ক্লাসের ব্যবস্থা করা হবে। উন্নত বুদ্ধি সম্পন্ন ছাত্র ছাত্রীদের সহায়ক গ্রন্থ পাঠে এবং জটিলতর সমস্যার সমাধানে উৎসাহিত করা হবে।

PEDAGOGICAL ANALYSIS IN THE PERSPECTIVE OF MODERN TEACHING STRATEGIES IN SCHOOL SUBJECTS

SUBJECT–LIFE-SCIENCE

Organised by—

INSTITUTE OF ADVANCED STUDIES IN EDUCATION (IASE)

DAVID HARE TRAINING COLLEGE

KOLKATA–700019

PREFACE

The State Level IASE Workshop on the "Pedagogical Analysis in the Penspective of Modern Teaching Strategies of School Subjects" organised by Institute of Advanced Studies in Education (IASE), David Hare Training College, Kolkata, brought together educators of various disciplines from different Universities and Colleges across the State.

The Workshop on 'Life Science' from 11th – 13th October, 2007 was successfully co-ordinated by myself, Amlan Ganguly, Lecturer in Zoology, David Hare Training College, while the veteran and highly experienced resource persons Dr. A. K. Chatterjee, (Retd.) Reader; David Hare Training College, Dr. D. P. Nag Choudhury, Reader, Ramkrishna Mission Sikshanamandira, Belur Math, Howrah and Dr. S. Nag, Reader St. Xavier's College, Kolkata guided and encouraged the participants (16 teachers of Life Science from different Universities and Colleges) to actively take part, discuss and interact on the very crucial aspect of modern teaching strategies of Life-Science. The three-day workshop witnessing various interesting approaches and opinions on Life Science teaching by the different educators proved to be an enriching, illuminating and rewarding experience to one and all.

AMLAN GANGULY

Co-ordinator (Life Science)

Workshop on the "Pedagogical Analysis in the Perspective of Modern Teaching Stategies of School Subjects."

PEDAGOGY

Pedagogy, the art or science of being a teacher, generally refers to strategies of instruction, or a style of instruction. Literally it means "to lead the child." In Ancient Greece, it also referred to a slave who supervised the education of his master's son (girls were not publicly educated). This involved taking him to school or a gym, looking after him and carrying his equipment (e.g. musical instruments). The Latin-derived word for pedagogy, education, is nowadays used in the English-speaking world to refer to the whole context of instruction, learning, and the actual operations involved with that, although both words have roughly the same original meaning. In the English-speaking world the term pedagogy refers to the science or theory of educating.

Pedagogy is also sometimes referred to as the correct use of teaching strategies. For example, Paulo Freire referred to his method of teaching adults as "critical pedagogy". In correlation with those teaching strategies the instructor's own philosophical beliefs of teaching are harbored and governed by the pupil's background knowledge and experiences, personal situations, and environment, as well as learning goals set by the student and teacher. One example would be the Socratic schools of thought.

Dr. D. P. Nag Choudhury, Reader
Ramkrishna Mission Sikshanamandira,
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PEDAGOGICAL ANALYSIS

No. – 01

Prepared by : Asima Samanta (Lecturer)
College : Parameswar Mahavidyalaya
P.O.–Namkhana

Subject : Life Science

B. Ed. Calcutta University

Pedagogical Analysis : College :

No :

Date : from 11.10.'07 to 13.10.'07

Name :

Roll No.

CONTENT ANALYSIS

Unit : Flower **Class–VII**

Subunits : **No. of periods**

1. Definition and Types of Flower	:	01
2. Complete and Incomplete flowers with its parts and examples	:	02
3. Regular and Irregular Flower with Examples	:	01
	Total =	04

ANALYSIS OF SUBUNIT

Selected Subunit : Complete and Incomplete flower with its parts and examples

Brief Summary of Concept or Matter :

1. Flower is nothing but modified shoot–**Definition.**
2. There are two types of flower–Complete and Incomplete flower–**Types.**
3. Complete flower consists of all the four whorls i.e. Calyx, Corolla, Androecium and Gynoecium eg. Bak.
4. In incomplete flower floral whorls are not four in number. Here any one of four whorls are absent e.g. Gourd.
5. The four floral whorls help in photosynthesis, attraction of pollinating agent for nonscented flower, reproduction.

PREVIOUS LEARNING :

1. A typical flowering plant can be exteernally distiuguished into a portion of plant that remain above the soil is called the **shoot.** While the portion of plant which lies below soil is called **root.**
2. The shoot bears **stem, branches, leaves** when plants matures it bears flower, fruit, seed.

OBJECTIVES

1. Cognitive :

a) Knowledge :

i) The students will be able to recall the definition of flower.
ii) They will be able to state the name of different floral whorls in complete flower.

b) Understanding :

i) The students will be able to explain how the different floral whorl acts.
ii) They will be able to distinguish between calyx and corolla.
iii) They will be able to distinguish between complete and in-complete flower.

c) Application :

i) The students will be able to analyse the reason of the effects of removal of gynoecium from all the flower.
ii) The students will be able to relate the function of corolla with pollination.

2. Affective :

i) The students will show interest to know different examples of complete and incomplete flowers.
ii) The students will show interest about the pollination of flower.

3. Psychomotor :

i) The students will be able to draw the diagram of different parts of a complete flower.

ii) They will be able to disect the different floral whorls.

TEACHING STRATEGIES

Broad Method of Teaching :

1. By interactive **Lecture method,** the students should be provided information about **defination, types** of flower, and function of floral whorls.
2. Through **Lecture** cum **demonstration** method, the students should be provided with information about parts of **complete** and **incomplete flower.**

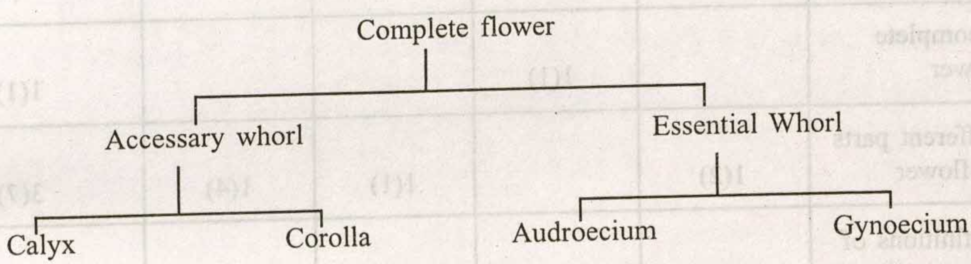
Equipments : Chalk, Duster, Black board, Previously Prepared chart showing different parts of complete flower, original specimen of flower.

Demonstration/Display/Experimentation/Students Activity/ Group Activity :

1. The different floral whorls by desecting the original flower (jaba) will be demonstrated.
2. The students will observe the overall procedure and they will answer the questions asked by the teacher.

Use of chalk/white Board :

1. Definition and types of flower will be written on the black board.
2. The different parts of complete flower will be written in tabular form on black board.



Probing Questions :

1. Why Androecium & Gynoecium are called essential whorls?
   Ans. It helps in pollination and produce seed which produce new Plant.
2. How calyx and corolla can be treated as accessary floral whorls but not as essential ones?
   Ans. They help in reproduction but not directly involve in reproduction.

Examples to illustrate concept/content

Concept/Content	Examples
1. Definition of flower	1. Jaba is a flower because it is formed from axillary bud.
2. Complete flower	2. Jaba because it has four floral whorls.
3. Incomplete flower	3. Gourd (It has three floral whorls).

Work Sheet : The students will be asked to write down the answers of the following items in their note book in class room.

1. Match the following :

Jaba	Essential whorls
Gourd	Incomplete flower
Calyx	Complete flower
Androecium	Accessary whorls.

2. The part of Androecium are —, —, —, —

CRITERION REFERENCED TEST

(Based on objectives cited before)

Table of Specification

Objectives/ Concept	K Item/Mark	U Item/Mark	A Item/Mark	SK Item/Mark	Total No. of items Total Marks
Complete flower	1(1)				1 (1)
Incomplete flower		1(1)			1(1)
Different parts of flower	1(2)		1(1)	1(4)	3(7)
Definitions of flower		1(1)			1(1)
Total of items	02	02	01	01	06
Total Marks	03	02	01	04	10
Weightage of Marks in (%)	30%	20%	10%	40%	100%

Test Items : Answer all the items

1. What is meant by complete flower? (K) 1
2. Why Gourd is an incomplete flower? (U) 1
3. What would happen if Pea flower is devoid of Androecium? (A) 1
4. Draw an labelled diagram of different floral whorls. (S) 4
5. Name the essential whorls of a flower. (K) 2
6. Which portion of plant is modified shoot? (U) 1

PEDAGOGICAL ANALYSIS

No. : 02

Prepared by : Sumana Datta
Calcutta Girls' B.T. college

Subject : Life Science

Date : from 11.10.2007 to 13.10.2007

CONTENT ANALYSIS

Unit : Flower

Class–VII

Subunits :

		No. of periods
1. Definition, parts of a complete flower with examples and functions		1
2. Regular Flower :	Jaba	1
3. Regular Flower :	Datura	1
4. Irregula Flower :	Pea	1
5. Complete Flower :	Bak	1
6. Incomplete Flower :	Gourd	1
		Total = 6

ANALYSIS OF SUB UNIT

SUBNIT : 2) Regular Flower : Jaba

BRIEF SUMMARY OF CONCEPTS OR MATTER

CONCEPT	SUMMAR
1. Definition of Regular Flower : Jaba	A flower that can be cut into two halves at any plane is known as Regular Flower, for eg-Jaba, Datura. Jaba is a complee, regular, bisexual, pedicillate flower. It is red in colour with the four whorls arranged on the thalamus.
2. Calyx	The calyx are fomed of 5 sepals, united, bell shaped, green in colour with minute hairs having pointed leafy epicalyx at base.
3. Corolla	Red in colour, five petals, free/polypetalous, non-scented.
4. Androecium	Stamens numerous, fused togather to form staminal coloumin. Monadelphous stamen, anthers unlobed, yellow, reniform, filament short.
5. Gynoecium	Five carpels fused, ovary, round, five chambered containing ovules.

PREVIOUS KNOWLEDGE :

1) The students have seen quite a large number of flowers in their gardens.
2) They are aquainted with Jaba as a common garden flower.
3) The students are aware of the essential and accessory whorls of a flower.

OBJECTIVES :

1. Cognitive

a) Knowledge :

i) The students will be able to recall the definition of regular flower.

ii) The students will be able to recall the definition of monaldelphous stamen.
iii) The students will be able to state the different parts of Jaba flower.

b) Understanding :

i) The students will be able to explain the roles of calyx and epicalyx of the flower in bud condition.
ii) The students will be able to compare the structure of monadelphous stamen of Jaba with the androecium of other flowers.

c) Application :

i) The students will be able to predict the role of flower in the formation of the future generation of the plant.
ii) The students will be able to draw conclusion on the effect of the removal of gynoecium from the flower.
iii) The students will be able to analyse the effect of removal of corolla from a non-scented flower Jaba.

2. Affective

i) The students will be interested to know other examples of complete, regular flower.
ii) The students will show interest about the type of pollination that occurs in Jaba.

3. Psychomotor

i) The students will be able to draw labelled diagram of the complete flower of Jaba.
ii) The students will be able to draw labelled diagram of the floral whorls of Jaba.
iii) The students will be able to dissect the different parts of Jaba and display them in a scrap book.

TEACHING STRATEGIES

Broad Methods of Teaching :

1. By interactive lecture method, the students should be provided information about the floral structures of Jaba, description of different parts.
2. By lecture cum display method the students will be provided with information regarding the detailed floral parts of Jaba.

Teaching Learning Materials (Equipments) :

1. Fresh specimens of Jaba–The teacher carries fresh specimens of Jaba, dissects the flower and displays different floral structures.

2. A chart showing detailed floral structure of Jaba.
3. General classroom aids like chalk, dustrer, blackboard pointer.

DEMONSTRATION/DISPLAY/EXPERIMENTATION/ STUDENTS ACTIVITY/GROUP ACTIVITY

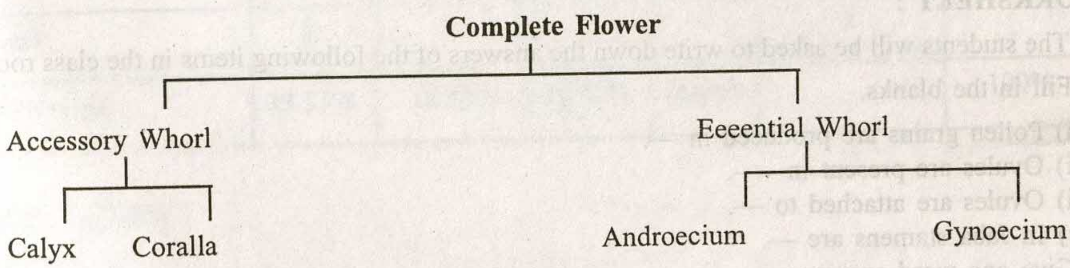
Fresh specimens of Jaba are demonstrated by the teacher and different floral parts are dissected and displayed.

The students are divided into groups and each group is provided with fresh specimen for observation and dissection.

BOARD WORK

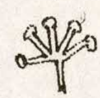
The names of different types of regular flower, floral structure of Jaba, may be written as arrow diagram. Besides various keywords should be written on the blackboard.

Regular flowers–Flower which can be cut into two similar halves at any plane eg. – Jaba Datura.





Kidney-shaped anther (reniform)



Five lobed stigma

PROBING QUESTIONS :

1) What will be the consequence if the gynoecium is removed from the flower?
   Ans. If the gynoecium is removed self fertilisation will not take place.
2) What problem may happen if the androecium is placed at the base of the ovary?
   Ans. If the androecium is placed at an inferior position then it will face problem regarding dispersal of pollen grains.

EXAMPLES TO ILLUSTRATE CONCEPTS/CONTENT

Concepts	Examples
1) Jaba is a complete regular flower	It bears essential & accessory whorls containing all the floral members and can be cut into 2 halves at any plane.
2) Calyx	The calyx is green in colour and is bell shaped bearing epicalyx.
3) Corolla	The calyx is brightly coloured which helps in cross pollination eg.–Jaba, Nayantara.
4) Androecium	Stamen numerous, monadelphons, staminal tube formation.
5) Gynoecium	Carpels united, five chambered stigma five lobed.

WORKSHEET :

The students will be asked to write down the answers of the following items in the class room.

1) Fill in the blanks.
   i) Pollen grains are produced in —.
   ii) Ovules are present in ——.
   iii) Ovules are attached to —.
   iv) In Jaba stamens are —.
2) Give one word answer :
   i) Shape of the anther found in Jaba.
   ii) Type of androecium in Jaba.

CRITERION REFERENCED TEST

(Based on objectives cited before)

Table of Specification

Objectives/ Concept	Know-ledge	Under-standing	Appli-cation	Skill	Number of Questions	Percen-tage
1. Definition of Regular Flower Jaba	1(1)	1(1)			2	33.33%
2. Calyx		1(1)			1	16.66%
3. Corolla			1(1)		1	16.66%
4. Androecium				1(1)	1	16.66%
5. Gynoecium	1(1)				1	16.66%
Total	2	2	1	1	6	
Percentage	33.33%	33.33%	16.66%	16.66%		100%

TEST ITEMS :

Answer all items :

Knowledge :

1. Define a regular flower. (1)
2. Describe the nature of the gynoecium in china rose. (1)

Understanding :

3. Mention the function of calyx in a flower. (1)
4. Differentiate between accessory and essential whorls. (1)

Application :

5. What is the importance of colour and sweet scent of a flower. (1)

Skill :

6. Draw a labelled diagram of the androecium of china rose. (1)

PEDAGOGICAL ANALYSIS

No. : 03

Prepared by : Shailesh Chandra Sarker, Lecturer, Balurghat B. Ed. College, Dakshin Dinajpur.

Subject : Life Science

CONTENT ANALYSIS

Unit – উদ্ভিদের ফল ও বীজের গঠন এবং বীজের অঙ্কুরোদ্‌গম। সপ্তম শ্রেণী

Sub-Units	**No. Of Periods.**
1) ফলের সংজ্ঞা ও গঠন (আম)।	01
2) বীজের সংজ্ঞা, প্রকারভেদ ও বীজ এবং ফলের সম্পর্ক।	01
3) দ্বিবীজপত্রী অসস্যল বীজের (মটর) গঠন	01
4) একবীজপত্রী সস্যল বীজের (ভুট্টা) গঠন।	01
5) বীজের অঙ্কুরোদ্‌গম ও তার প্রকারভেদ এবং অঙ্কুরোদগমের শর্তাবলী।	01
6) অঙ্কুরোদ্‌গমের শর্তাবলীর পরীক্ষা।	01
A) মূল্যায়ন 01	
B) পুনঃ শিক্ষণ (সংশোধনী পাঠ).........01	
মোট পিরিয়ড সংখ্যা 07	

ANALYSIS OF SUB-UNIT

Selected Sub-Unit : বীজের অঙ্কুরোদ্‌গম ও অঙ্কুরোদ্‌গমের শর্তাবলীর পরীক্ষা।

Brief Summary of Concepts or Matter :

Concepts	Summary
i) অঙ্কুরোদ্‌গমের সংজ্ঞা	i) অনুকূল পরিবেশে বীজের মধ্যেকার সুপ্ত ভ্রূণের জাগরণ ও বৃদ্ধির লক্ষণ প্রকাশিত হবার পদ্ধতিকে অঙ্কুরোদ্‌গম বলে।
ii) অঙ্কুরোদ্‌গমের প্রকারভেদ।	ii) অঙ্কুরোদ্‌গম প্রধানত দু' প্রকার i) মৃদবর্তী ও ii) মৃদভেদী। এছাড়া কিছু উদ্ভিদে জরায়ুজ অঙ্কুরোদ্‌গম দেখা যায়।
iii) অঙ্কুরোদ্‌গমের জন্য প্রয়োজনীয় বাহ্যিক শর্তাবলী	iii) বীজের অঙ্কুরোদ্‌গম প্রধানত তিনটি প্রয়োজনীয় বাহ্যিক শর্তের উপর নির্ভরশীল—1) জল, 2) উষ্ণতা ও 3) অক্সিজেন।
iv) অঙ্কুরোদ্‌গমের পরীক্ষা	iv) অঙ্কুরোদ্‌গমের বিভিন্ন শর্তের প্রয়োজনীয়তা বুঝতে তিনটি পুষ্ট ও সুস্থ মটর বীজের সাহায্যে পরীক্ষার বর্ণনা।

Previous Knowledge/Learning :

1) শিক্ষার্থীরা ফুল থেকে ফল ও বীজ হয় দেখেছে।
2) তারা অঙ্কুরিত ছোলা বীজ দেখেছে।
3) যে কোন জীবের বেঁচে থাকার জন্য জল, উষ্ণতা, বায়ুর অক্সিজেন, সূর্যের আলো ইত্যাদির প্রয়োজনীয়তার পূর্বজ্ঞান তাদের আছে।

OBJECTIVES :

A) Cognitive :

1) Knowledge :

i) "অনুকূল অবস্থায় বীজের সুপ্তদশা ভেঙ্গে নতুন উদ্ভিদ জন্মাবে"—অঙ্কুরোদ্‌গমের এইরূপ সংজ্ঞা শিক্ষার্থীরা বলতে পারবে।

ii) অঙ্কুরোদ্‌গমের প্রকারভেদ বলতে পারবে।

iii) বীজের অঙ্কুরোদ্‌গমের শর্তগুলির নাম ও তাদের প্রয়োজনীয়তা উল্লেখ করতে পারবে।

2) Understanding :

i) মৃদবর্তী ও মৃদভেদী অঙ্কুরোদ্গমের ব্যাখ্যা এবং তাদের মধ্যে পাথর্ক্য বলতে পারবে বা করতে পারবে।

ii) বীজের অঙ্কুরোদ্গমের জন্য বিভিন্ন শর্তের প্রয়োজনীয়তা ব্যাখ্যা করতে পারবে।

iii) অঙ্কুরোদ্গম পরীক্ষার ত্রুটিগুলি সনাক্ত করতে পারবে।

3) Application :

i) বীজ থেকে চারা তৈরীর মাধ্যমে বাগান তৈরী ও বাগানের পরিচর্যায় এই জ্ঞান কাজে লাগাতে পারবে।

ii) বীজের অঙ্কুরোদ্গমে কোন সমস্যা তৈরী হলে তা খুঁজে বের করতে পারবে।

iii) অঙ্কুরোদ্গমের পরীক্ষা পদ্ধতি পর্যবেক্ষনের মাধ্যমে সিদ্ধান্তে উপনীত হতে পারবে।

B) Affective :

i) বীজের বিভিন্ন প্রকার অঙ্কুরোদ্গম (মৃদ্বর্তী, মৃদ্ভেদী) পর্যবেক্ষনে আগ্রহী হবে।

ii) অঙ্কুরিত বীজ ধীরে ধীরে কিভাবে চারাগাছে পরিণত হয় তা জানার আগ্রহ শিক্ষার্থীদের বাড়বে।

iii) অঙ্কুরোদ্গমের অভ্যন্তরীণ ও বাহ্য শর্তগুলি সম্পর্কে শিক্ষার্থীদের বৈজ্ঞানিক দৃষ্টিভঙ্গী তৈরী হবে।

C) Psychomotor :

i) মৃদবর্তী ও মৃদভেদী অঙ্কুরোদ্গমের চিত্র অঙ্কন করতে পারবে।

ii) শিক্ষার্থীরা বিভিন্ন প্রকার বীজের অঙ্কুরোদ্গম করাতে পারবে।

iii) অঙ্কুরোদ্গমের পরীক্ষার চিত্র আঁকতে শিক্ষার্থীরা সক্ষম হবে।

TEACHING STRATEGIES

Broad Method of Teaching :

Concepts	Methods
1) অঙ্কুরোদ্গমের সংজ্ঞা	1) বক্তৃতা পদ্ধতি।
2) অঙ্কুরোদ্গমের প্রকার ভেদ	2) বক্তৃতা পদ্ধতি।
3) অঙ্কুরোদ্গমের জন্য প্রয়োজনীয় বাহ্যিক শর্ত সমূহ	3) বক্তৃতা পদ্ধতি।
4) অঙ্কুরোদ্গমের শর্তাবলীর পরীক্ষা।	4) বক্তৃতা ও প্রতিপাদন পদ্ধতি।

Teaching Equipments :

Equipments	Uses
1) শ্রেণী কক্ষের সাধারণ উপকরণ সমূহ (চক, ডাস্টার, ব্ল্যাকবোর্ড)	1) শ্রেণী কক্ষে পঠন পাঠনের সময় অঙ্কুরোদগমের সংজ্ঞা, প্রকারভেদ, প্রয়োজনীয় বাহ্যিক শর্তাবলী, পরীক্ষার উপকরণ ইত্যাদি শেখানোর জন্য ব্যবহৃত হবে।
2) তিনটি মটর বীজের অঙ্কুরোদ্গমের পরীক্ষার চিত্র সম্বলিত চার্ট।	2) অঙ্কুরোদ্গমের পরীক্ষাটি ব্যাখ্যা করে শিক্ষার্থীদের বোঝানোর জন্য ব্যবহৃত হবে।
3) পয়েন্টর (নির্দেশক দন্ড)	3) অঙ্কুরোদ্গমের পরীক্ষার চার্টটি দেখানোর জন্য ব্যবহৃত হবে।

Demonstration/Display/Experimentation/Students Activity/Group Activity

Method	Teacher's Role	Students Activity
1) প্রতিপাদন	1) বীজের অঙ্কুরোদ্গমের জন্য যে জল, বায়ু বা অক্সিজেন এবং উপযুক্ত তাপমাত্রার প্রয়োজন সেই বিষয়ের পরীক্ষাটির চার্ট দেখিয়ে শিক্ষকমহাশয় শিক্ষার্থীদের সামনে পরীক্ষাটি প্রতিপাদন করবেন।	1) শিক্ষকের দ্বারা বীজের অঙ্কুরোদ্গম পরীক্ষাটি প্রতিপাদনের সময় শিক্ষার্থীরা পরীক্ষার উপকরণগুলি খাতায় লিপিবদ্ধ করবে, পরীক্ষাটি পর্যবেক্ষন করবে এবং খাতায় পরীক্ষা ব্যবস্থার ছবি আঁকবে।

Probing Questions with Brief Answers :

Questions	Answers
1) বীজের অঙ্কুরোদ্গমের জন্য কত ডিগ্রী তাপমাত্রার প্রয়োজন?	1) বীজের অঙ্কুরোদগমের জন্য $25^0C - 35^0C$ তাপমাত্রার প্রয়োজন।
2) অঙ্কুরোদ্গমের পরীক্ষার জন্য জল ফুটিয়ে ঠান্ডা করে নেওয়া হয় কেন?	2) জল ফুটিয়ে ঠান্ডা করে নিতে হয় যাতে জলে মিশে থাকা অক্সিজেন বেরিয়ে যায়।

Questions	Answers
3) অঙ্কুরোদগম পরীক্ষার সময় যে কাঠের টুকরো নেওয়া হয় তার উপর মোমের প্রলেপ দেয়া হয় কেন?	3) কাঠের টুকরোর মধ্যে যাতে জল এবং বাতাস প্রবেশ করতে না পারে তারজন্য কাঠের টুকরোর গায়ে মোমের প্রলেপ দেওয়া হয়।
4) শীতকালে দেখা যায় না কিন্তু গ্রীষ্মকালে সামান্য বৃষ্টি হলেই মাঠে নানা উদ্ভিদের চারাগাছ (ধান, সরিষা) দেখা যায় কেন?	4) শীতকালে উপযুক্ত উষ্ণতা থাকে না ফলে বীজ অঙ্কুরিত হতে পারে না কিন্তু গ্রীষ্মকালে তাপমাত্রা বাড়ে এবং সেই সংগে সামান্য বৃষ্টি হলে মাঠে থাকা সুপ্ত বীজ অঙ্কুরিত হয়। ফলে চারাগাছ দেখা যায়।

Example to Illustrate Concepts/Content.

Concepts/Contents	Examples
1) অঙ্কুরোদ্গমের সংজ্ঞা	1) প্রাণীদের ভ্রূণ থেকে যেমন কতকগুলি অনুকূল পরিবেশে শিশুপ্রাণীর জন্ম হয় তেমনি বীজের মধ্যে থাকা সুপ্ত ভ্রূণ অনুকুল শর্তসাপেক্ষে অঙ্কুরোদগম হয়।
2) অঙ্কুরোদ্গমের প্রকারভেদ	2) প্রাণীদের ক্ষেত্রে যেমন বিভিন্ন প্রাণীর ভ্রূণ বিভিন্নভাবে শিশু প্রাণীর জন্ম নেয় তেমনি উদ্ভিদের ক্ষেত্রেও বিভিন্ন বীজের অঙ্কুরোদ্গমে বিভিন্নভাবে হয়।
3) অঙ্কুরোদ্গমের জন্য প্রয়োজনীয় বাহ্যিক শর্তসমূহ	3) প্রাণীদের মতই উদ্ভিদের বীজে অঙ্কুরোদ্গমের জন্য বিভিন্ন শর্তের প্রয়োজন।
4) অঙ্কুরোদ্গমের পরীক্ষা	4) প্রাণীদের ক্ষেত্রে একটি ভ্রূণ যেমন অনুকূল পরিবেশ না পেয়ে শিশু প্রাণীর জন্ম হয় না তেমনি অনুকূল শর্ত না পেলে বীজের অঙ্কুরোদ্গম হয় না ফলে চারাগাছ জন্মায় না।

Board Work :

1) অঙ্কুরোদ্গমের সংজ্ঞা লিখতে হবে।

2) অঙ্কুরোদ্গমের প্রকারভেদ বোর্ডে লিখতে হবে।

3) অঙ্কুরোদগমের জন্য প্রয়োজনীয় বাহ্যিক শর্ত সমূহ বোর্ডে লিখতে হবে।

4) অঙ্কুরোদগমের জন্য প্রয়োজনীয় শর্ত (বাহ্যিক) সমূহের অভাবে যে বীজের অঙ্কুরোদগম হয় না, তার পরীক্ষার জন্য প্রয়োজনীয় উপকরনগুলি বোর্ডে লিখতে হবে।

ছবি ঃ



তিনটি মটর বীজের পরীক্ষা

CRITERION REFERENCED TEST

Table of Specification

Objectives/ Concept/ Subject	K Item/Mark	U Item/Mark	A Item/Mark	SK Item/Mark	Total No. of items / Total Marks
1. অঙ্কুরোদ-গমের সংজ্ঞা	01(01)	00(00)	00(00)	00(00)	01(01)
2. অঙ্কুরোদ-গমের প্রকারভেদ	01(00)	01(01)	00(00)	00(00)	01(01)
3. অঙ্কুরোদ-গমের জন্য প্রয়োজনীয় বাহ্যিক শর্ত সমূহ	01(01)	01(01)	00(00)	00(00)	02(02)
4. অঙ্কুরোদ-গমের পরীক্ষা	00(00)	00(00)	01(02)	01(04)	02(06)
Total no of Items / Total Marks	02 (02)	02 (02)	01 (02)	01 (04)	06 (10)
Weightage of marks in (%)	20%	20%	20%	40%	100%

TEST ITEMS

Full Marks = 10

Questions	Marks	Type of Questions	Based on.
1. অঙ্কুরোদগম-এর সংজ্ঞা কি?	(01)	SA	K
2. সঠিক উত্তরটি চিহ্নিত কর অঙ্কুরোদগম—a) 4 প্রকার b) 2 প্রকার c) 3 প্রকার..	(01)	O	U
3. অঙ্কুরোদগমে জলের ভূমিকা কি?	(01)	VSA	K
4. অঙ্কুরোদগমের বাহ্যিক শর্ত কি কি?	(01)	VSA	K
5. অঙ্কুরোদগমের পরীক্ষার সময় কাঠের টুকরোর উপরে মোমের প্রলেপ দেওয়া হয় কেন?	(02)	SA	A
6. অঙ্কুরোদগমের পরীক্ষায় তিনটি মটর বীজের চিহ্নিত চিত্র অঙ্কন কর।	(04)	LA	SK

PEDAGOGICAL ANALYSIS

No. – 04

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Subject : Life Science **Date :** 11.10.2007 to 13.10.2007

CONTENT ANALYSIS

Chapter–III : Outline idea and importance of plants and animals **Class–VII**

UNIT : Plants

Sub-Units	**No. of Period**
1 Cereals : (a) Paddy, (b) Wheat, (c) Maize	02
2. Pulses : (a) Pea, (b) Masur	01
3. Fibre Yielding plants : (a) Jute, (b) Cotton	01
4. (i) Timber yielding plant : Sal (ii) Oil yielding plants : (a) Coconut (b) Mustard	02

Total Period : 06
Evaluation : 01
Reteaching : 01

Sum Total : 08

ANALYSIS OF SUB-UNIT

SELECTED SUB-UNIT : Outline idea and importance of cereals eg. (a) Paddy, (b) Wheat and (c) Maize

BRIEF SUMMARY OF CONCEPT OR MATTER

The cereals are the most important sources of plant food for mankind and also for lower animals since the earliest time. Certain plants of the family Gramineae (Poaceae) whose grains are used as food are called cereals. Cereals are cultivated for their grains. Notable cereals available in India are Paddy, Wheat and Maize. These are very important food grains. The plants are herb in nature.

CONCEPTS		SUMMARY
1. PADDY	i) Scientific name	***Oryza sativa*** **L.**
	ii) Nature	It is also called rice plant. Plants are annual, leave flat, linear, Inflorescence spikelets, arranged in panicle, drooping, rachis angular. Monocot.
	iii) Types	Autumn–Aus; Winter–Aman; Spring or Summar–Boro.
	iv) High yielding variety	Padma, Jaya, Ratna, IR-8 etc.
	v) Paddy producing States	W. Bengal, Asam, Bihar, U.P, Punjab and Maharashtra.
	vi) Main use	Cereal (As food)
2. WHEAT	i) Scientific name	***Triticum aestivum*** **L.**
	ii) Nature	Belongs to the Famly Poaceae. Plant is annual herb. Leaf blades linear, Inflorescence–earect spikes, spikelets, solitary, sessile, Monocot.
	iii) High yielding variety	Janak, Girija, Safed Lama, Kalyan Sona, Monalisa
	iv) Wheat yielding state	Punjab, Hariana, Rajesthan, M.P.
	v) Main use	Cereal (As food)
3. MAIZE	i) Scientific Name	***Zea mays*** **L.**
	ii) Nature	Also called maize plant. Plants are tall, annual, monoecious. Stem is solid, leaf blades flat, Male inflorescence is paniculate raceme, Female inflorescence is axillary. Annual, creeper. It grows upwardly climbing with the help of tendril. Dicot
	iii) Uses	Maize is used in various ways. It is also grown a fodden for livestock.

PREVIOUS KNOWLEDGE/LEARNING :

1) The students have concrete idea about economically important plants.
2) The students have seen Paddy, Wheat and Maize in their surroundings.
3) In their earlier classes, the students have been acquainted with the external features of plants.
4) The students already know about the usefulness of some plants like rice, wheat etc.

DEVELOPING BEHAVIOURAL OBJECTIVES :

A. Cognitive

1. **Knowledge :** The students will be able to :

1.1. State the scientific names of economically important plants.

1.2. Recall the economic uses of plants and important parts.

1.3. Recognise the food values of the cereals.

1.4. State the different uses of cereals.

2. **Comprehension/Undenstanding :**

2.1. The learners will understand the use of various parts of the plants.

2.2. They can be able to distinguish among Paddy, Wheat and Maize.

2.3. Justify why Paddy is treated as the principal food grain.

2.4. Give reasons in support of increased paddy production in India.

3. **Application :**

3.1. The learners will be able to say the distinctive features of Paddy, wheat and Maize.

3.2. The students will be able to find out the impotance of economically useful plant.

3.3. They will be able to relate nutritive values of Paddy, wheat and Maize.

B. Affective :

4.1. The students will be interested to know about the different parts of the plants and their economic importance and uses.

4.2. Student will be able to identify the principal states where maximum yield of the cereals are awailable.

C. Psychomotor :

5.1. The learner will be able to draw a clear diagram of Paddy plant/Wheat plant/Maize plant.

5.2. They can demonstrate the live specimen.

TEACHING STRATEGIES

Broad Method of Teaching

Concepts	Method
1. Habit, habitat and nature of Paddy, Wheat and Maize	By interective lecture method and Demonstration method with 'live specimen in the class room situation.
2. Main use and importance	By Demonstration method.

TEACHING EQUIPMENTS

Equipments	Use
1. General equipments of a classroom.	Showing a chart related to the structure of a Paddy, Wheat and Maize plants, various parts of a plant will be indentified by using a pointer.
2. A chart related to the structure of Paddy, Wheat and Maize plants.	The learners will be able to know the respective different components of a plant.

DEMONSTRATION/PRESENTATION/EXPERIMENTATION/ACTIVITY

	Teacher Activity	Students' Activity
Demonstration	The teacher will demonstrate the different parts of the plant body with the help of a pointer by showing them a chart.	The students will answer different questions asked by the teacher. They will simulataneously identify different parts of the Paddy, Maize and Wheat plant by the active participation with their teacher.

BOARD WORK

The teacher uses the blackboard to write down the scientific names of paddy, wheat and maize, and the important uses of cereals, husk etc.

PROBING QUESTIONS WITH BRIEF ANSWERS

Questins	Answers
1) What do you mean by cereals?	1) Certain plants of the family Graminae (Poaceae) where grains are used as food are called cereals.

Questins	Answers
2) Name the high yielding varieties of Rice and Wheat.	2) High yielding varieties of Rice are Padma Jaya, Ratna and IR-8, and in case of Wheat notable high yielding varieties are Janat, Girija, Safed, Lama, Kalyan Sona, Monalisa etc.

WORKSHEET

The students will be asked to write down the answers of the following items in their notebook in the class-room–

1) Name the edible part of rice grain.
2) What is caryopsis?
3) From nutritive point of view, why pea is superior to rice?

EXAMPLE TO ILLUSTRATE CONCEPTS/CONTENT

Concept/Content	Example
Cereals	Paddy, Wheat and Maize
Nature	Belongs to the family Graminae (Poaceac)
Paddy yielding states	W. Bengal, Asam, Bihar, U.P., Punjab etc.
Main use of Maize	Maize is used in various ways, food, fodder and livestock.

CRITERION REFERENCED TEST

Table of specification

Concepts	Knowledge	Comprehension	Application	Skill	Total	%
Definition of cereals	1 (Q No. –1)			1 (Q, No.–6)	2	33.32%
Paddy and Wheat	1 (Q.No.–4)	1 (Q.No. –2)			2	33.32%
Maize			1 (Q.No. –3)		1	16.66%
Importance		1 (Q.No.–5)			1	16.66%
Total	2	2	1	1	6	100%
Percentage	33.32%	33.32%	16.66%	16.66%	100%	

TEST ITEMS

1. What is cereal?
2. What is the difference between rice and wheat?
3. What is the distinctive feature of Maize plant by which it can be separated from others?
4. Which part of the maize is non-edible for human beings?
5. Why cereals are called economic important plants?
6. Point out various parts of a wheat plant after a neat sketch.

PEDAGOGICAL ANALYSIS

No. : 05

Prepared by Mr. AMLAN GANGULY (LECTURER)
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CONTENT ANALYSIS

UNIT –Medicinal Plants.

Subunits	**Periods**
1. General idea on Medicinal plants, Tulsi, and Neem	01
2. Sarpagandha and *Cinchona*	01
3. *Penicillium*	01
	Total = 03
	Evaluation = 01
	Reteaching = 01
	Sum Total = 05

ANALYSIS OF SUBUNIT

Selected submit : Sarpagandha and Cincona.
Brief Summary of concepts or matter

Concept	Summary
A) *Sarpagandha*	
(1) General description of Sarpagandha	Sarpagandha is a flowering dicotyledonous, perinnial shrub, growing in plains.
(2) Usable parts of Sarpagandha	Root bark, it possesses the alkaloids rouwolfine, resenpire & serpentine.
(3) Medicinal value of Sarpagandha	The alkaloid reserpine, obtained from root extract of Sarpagandha, is used to lower blood pressure
B) *Cinchona*	
(4) General description of *Cinchona*	*Cinchona* is a flowering dicotyledonous tall evergreen tree, growing in mountaineous region.
(5) Parts used of *Cinchona*	Bark of Stem
(6) Medicinal value of *Cinchona*	The alkaloid quinine obtained from the bark is used in the treatment of malarial fever.

PREVIOUS KNOWLEDGE/LEARNING :

i) The students are aware of the medicinal use of some common plants like Tulsi, Kalmegh, Turmeric, Thankuni, etc.

ii) The students know the name of quinine as a medicine for malarial fever.

iii) In their earlier class they have read about the external features of plant body.

OBJECTIVES :

1. Cognitive :

a) Knowledge :

i) The students will be able to state the scientific names of Sarpagandha & *Cinchona*.

ii) The students will be able to name the alkaloids obtained from Sarpagandha and *Cinchona*.

iii) The students will be able to describe the medicinal value of Sarpagandha & *Cinchona*.

b) Understanding :

i) The students will be able to compare the medicinal values of Sarpagandha and *Cinchona*.

iii) The students will be able to distinguish the general features of Sarpagandha & *Cinchona*.

c) Application :

i) The students will be able to inter-relate between Malaria and Quinine.

ii) They will be able to solve problems related to hypertension and its treatment.

2. Affective (Interest, value, Scientific attitude)

i) The students will be able to appreciate the role of different medicinal plants.

ii) The will preserve or conserve the medicinal plants in their surrounding.

3. Psychomotor :

i) The students will be able to draw the labelled diagram of Sarpagandha and *Cinchona*.

TEACHING STRATEGIES

Broad Method of Teaching

Concept/Content	Method
General description of Sarpagandha and *Cinchona*	Lecture cum demonstration method.
Medicinal value of Sarpagandha	Lecture method
Medicinal value of *Cinchona*	Lecture method

Teaching Learning Materials

Equipments	Used
Chalk, duster	For writting key words e.g. scientific names and drawing the labelled diagrams of *Cinchona* & Sarpagandha.
Labelled diagram of *Cinchona* & Sarpagandha	For describing the nature and various parts of the plants and parts used for medicinal purposes.

Use of Chalk/White board :

The scientific names of Sarpagandha and *Cinchona* will be written on the black board and the names of the alkaloids obtained from Sarpagandha & *Cinchona* & their uses will be written in a tabular form.

Demonstratin/Display/Experimentation/Students Activity/Group Activity :

Nicely prepared diagrams of *Cinchona* and Sarpagandha will be demonstrated and the alkaloids obtained from those plants and their uses will be displayed in tabular form by a well prepared chart.

Probing Questions with brief Answers :

(1) What is the necessity of preservation/conservation of *Cinchona* and Sarpagandha?

Ans. Because these two plants have lot of medicinal values. The alkaloids quinine and reserpine obtained from Cinchona and Sarpagandha respectively are used to treat the malarial fever and lowering the high blood pressure respectively.

(2) What is the utility of study the medicinal values of plants?

Ans. Because, almost all the plants possess some medicinal values, if the proper medicinal value of the plant is known, the plant can be used for human welfare.

Worsheet :

The students will be asked to match the following items of column A with column B in their notebook in classroom–

Colum–A	Colum–B
Sarpagandha	Quinine
Cinchona	Reserpine
	Rouwolfine

Example to Illustrate Concepts/Content

Concept/Content	Examples
Medicinal plants (a) Nature of the plants	(a) Both the Sarpagandha and *Cinchona* are dicot plants.
(b) Scientific Names	(b) *Rouwolfia serpentina* (Sarpagandha) *Cinchona succirubra*
(c) Eco. imp. parts	(c) Root bark in case of Sarpagandha & stem bark in case of Cinchona
(d) Useful products	(d) Quinine, Reserpine, etc.
(e) Use of products in treatment of diseases.	(e) Quinine for malarial treatment, Reserpine for lowering of blood pressure.

CRITERION REFERENCED TEST

(Based on objective cited before)

Table of Specification

Objectives/ Concept	K	U	A	SK	Total No. of Items	Total Marks
	Item/Mark	Item/Mark	Item/Mark	Item/Mark		
General nature of Sarpagandha	01/(01)			01/(03)	02	(04)
Medicinal value of Sarpagandha	01/(02)		01/(01)		02	(03)
Gen. nature of *Cinchona*		02/03			02	(03)
Medicinal value of *Cinchona*	–	–	–	–	00	(00)
Total no. of Items/ Total Marks	02/(03)	02/(03)	01/(01)	01/(03)	6	(10)
Weightage of Marks in (%)	30%	30%	10%	30%		100%

TEST ITEMS

Full Marks–10
Time– 15 Minutes

(1) State the scientific name of Sarpagandha...... (K) (1)

(2) Name the alkaloid necessary for lowering high blood pressure and from which plant it is obtained.............(K) (2)

(3) Compare the medicinal values of Sarpagandha & *Cinchona*.....(U) (2)

(4) A person suffering from the disease of hypertension (high-blood pressure), which type of herbal medicine you will suggest for the person.....(A) (1)

(5) Draw a labelled diagram of different parts of Sarpagandha......(S.K.) (3)

(6) Indentify which part of the *Cinchona* plant is used as herbal medicine (i) Root bark, (ii) Fruit, (iii) Seed, (iv) Stem...........(U) (1)

[K = Knowledge, U = Understanding, A = Application, SK = Skill]

PEDAGOGICAL ANALYSIS

No. 06

Prepared by

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Subject : Life Science

CONTENT ANALYSIS

Unit – উপকারী প্রাণী সমূহ

Sub-Units	**No. of Periods**
1) মৌমাছির গুরুত্ব	01
2) রেশমকীটের গুরুত্ব	01
3) মাছের গুরুত্ব	01
4) পোলট্রি পাখির গুরুত্ব	01
	Total = 04

ANALYSIS OF SUB-UNIT

Selected Sub-Unit : মৌমাছির গুরুত্ব

Brief Summary of Concepts or Matter :

Concepts	**Brief Summary**
1. প্রকৃতি ঃ	অমেরুদন্ডী, সন্ধিপদী, সামাজিক পতঙ্গ।
2. সাধারণ পরচিতি ঃ	i) মৌমাছিরা সাধারণত দলবদ্ধভাবে মৌচাকে বাস করে। ii) একটি মৌচাকে তিন ধরনের মৌমাছি থাকে। যথা—একটি রাণী, প্রায় দুইশত পুরুষ এবং প্রায় 40–50 হাজার শ্রমিক মৌমাছি।

Concepts	Brief Summary
	iii) এদের মধ্যে শ্রমবন্টন ব্যবস্থা দেখা যাওয়ায় এদের সামাজিক পতঙ্গ বলে। iv) রাণী ও পুরুষ মৌমাছিরা কেবল বংশবৃদ্ধির কাজে ব্যস্ত থাকে। অপরদিকে শ্রমিক মৌমাছিরা বাকি সব কাজ, যেমন মৌচাক তৈরী, রক্ষণাবেক্ষন, মধু সংগ্রহ, মধুসঞ্চয়, বাচ্চা মৌমাছিদের লালন পালন ইত্যাদি কাজ করে। v) কৃত্রিম পদ্ধতিতে মৌমাছি প্রতিপালনকে এপিকালচার বলে। vi) মৌমাছির জীবনচক্র ডিম, লার্ভা, পিউপা ও পুর্নাঙ্গ দশার মাধ্যমে সম্পূর্ণ হয়।
3. প্রয়োজনীয়তা ঃ	i) মৌমাছি ফুলের পরাগযোগ ঘটিয়ে উদ্ভিদের বংশবিস্তারে সাহায্য করে। ii) মৌমাছিদের কাছ থেকে আমরা মধু ও মোম পাই। iii) মধু হল সুস্বাদু ও পুষ্টিকর খাদ্য। iv) ইহা (মধু) জীবানু নিরোধক, সর্দি, কাশি ও শিশুদের অপুষ্টিজনিত রোগে ব্যবহৃত হয়। v) মৌমাছি থেকে প্রাপ্ত মোম থেকে মোমবাতি, প্রাণী ব্যবচ্ছেদ ট্রে তৈরীতে, প্রসাধন শিল্পে, যেমন স্নো, ক্রিম, লিপস্টিক ইত্যাদি তৈরীতে ব্যবহৃত হয়।

Previous Learning (Knowledge/Content/Comprehensive behaviour)

1) কিছু শিক্ষার্থীর মৌমাছি সম্পর্কে অতি সাধারণ ধারণা আছে।
2) মৌমাছি থেকে মধু পাওয়া যায়, এই ধারনাটি সকল ছাত্র-ছাত্রীর আছে।
3) মৌমাছি থেকে মোম পাওয়া যায়, এই সম্পর্কে কিছু শিক্ষার্থীর ধারনা আছে।

OBJECTIVES :

(1) COGNITIVE :

(a) Knowledge :

i) শিক্ষার্থীরা তিন ধরনের মৌমাছির নাম বলতে পারবে।
ii) মৌমাছিদের সমাজবদ্ধ জীবন সম্পর্কে তারা বলতে পারবে।
iii) Apiculture-এর সংজ্ঞা বলতে পারবে।

(b) Understanding :

i) মৌমাছির জীবনচক্রের বিভিন্ন দশাগুলি সনাক্ত করতে পারবে।

ii) বিভিন্ন প্রকার মৌমাছিদের মধ্যে (রাণী, পুরুষ ও শ্রমিক) পার্থক্য করতে পারবে।
iii) মৌমাছি কিভাবে মধু সংগ্রহ করে, সে সম্পর্কে সংক্ষেপে বলতে পারবে।
iv) শ্রমিক মৌমাছিদের মোমগ্রন্থি এবং তার থেকে প্রাপ্ত মোমের মধ্যে সম্পর্ক নির্ণয় করতে পারবে।

(c) **Application** :

i) ফুল, পরাগযোগ, মধু এবং মৌমাছির মধ্যে সম্পর্ক নির্ণয় করতে পারবে।
ii) মৌমাছির বাসা থেকে কিভাবে মধু সংগ্রহ করা হয়, সেটি দেখাতে পারবে।
iii) মৌমাছি কামড়ালে কি করা উচিত তা বলতে পারবে।
iv) বিভিন্ন রোগ নিরাময়ে মৌমাছির মধুর ব্যবহার সম্পর্কে বলতে পারবে।
v) প্রাণী ব্যবচ্ছেদের ট্রে তৈরীতে মৌমাছি থেকে প্রাপ্ত মোম কিভাবে ব্যবহার করা যায় তা বলতে পারবে।

(2) **AFFECTIVE** :

i) বিভিন্ন রোগ নিরাময়ে মৌমাছি থেকে প্রাপ্ত উপজাত বস্তুগুলিকে কিভাবে ব্যবহার করা যায় সে সম্পর্কে জানতে আগ্রহী হবে।
ii) দৈনন্দিন জীবনে মধু এবং মোমকে কিভাবে ব্যবহার করা যায় সে সম্পর্কে জানতে আগ্রহী হবে।
iii) মৌমাছির নাচ (Bee-dancing) সম্পর্কে জানতে আগ্রহী হবে।

(3) **SKILL** (Psychomotor) :

i) শিক্ষার্থীরা মৌমাছির জীবনচক্রের বিভিন্ন দশার Cut-out তৈরী করতে পারবে।
ii) শিক্ষার্থীরা মৌমাছির দেহের বিভিন্ন অংশের চিহ্নিত ছবি আঁকতে পারবে।
iii) তারা মৌমাছি থেকে প্রাপ্ত মধু অথবা মোম থেকে বিভিন্ন জিনিস তৈরী করতে পারবে।

TEACHING STRATEGIES

শিক্ষণের সাধারণ পদ্ধতি

ধারণা (Concepts)	পদ্ধতি (Methods)
1. প্রকৃতি 2. সাধারণ পরিচিতি 3. মৌমাছির প্রয়োজনীয়তা	1. বক্তৃতা পদ্ধতি 2. বক্তৃতা ও প্রতিপাদন পদ্ধতি 3. বক্তৃতা ও কর্ম সম্পাদন পদ্ধতি (Activity basec)

শিক্ষা সহায়ক উপকরণ (Teaching Learning Material)

উপকরণ	ব্যবহার
1. শ্রেণীকক্ষের সাধারণ উপকরণসমূহ (চক্, ডাস্টার, ব্ল্যাকবোর্ড)	1. Apiculture-এর সংজ্ঞা, মৌমাছির শ্রেণী বিন্যাস, শ্রমবন্টন, জীবনচক্র ইত্যাদি দেখানোর জন্য ব্যবহৃত হবে।
2. মৌমাছির জীবনচক্রের চিত্র সম্বলিত চার্ট (অচিহ্নিত)	2. মৌমাছির জীবনচক্রের বিভিন্ন দশা বর্ণনা করার সময় ব্যবহার করা হয়।
3. মৌমাছির চাকের মডেল। (অন্তর্গঠন)	3. মৌচাকে মৌমাছিদের প্রকারভেদ এবং তাদের বাসস্থানের তারতম্য বোঝানোর ক্ষেত্রে ব্যবহার করা হবে।
4. প্রাত্যহিক জীবনে ব্যবহৃত হয় এরকম বিভিন্ন সামগ্রীর Cut-out (কিছু মৌমাছি থেকে প্রাপ্ত এবং কিছু নয়।)	4. মৌমাছির প্রয়োজনীয়তা বোঝানোর ক্ষেত্রে ব্যবহার করা হবে।

প্রতিপাদন/প্রদর্শন/পরীক্ষা সম্পাদন/শিক্ষার্থীর দলগত সক্রিয়তা (Demonstration/Display/Experimentation/Students activity/Group Activity)

পদ্ধতি	শিক্ষকের কাজ	শিক্ষার্থীর সক্রিয়তা
Simulation Game-এর মাধ্যমে প্রতিপাদন	শিক্ষক মৌমাছিদের শ্রেণীবিন্যাস সুনির্দিষ্ট নির্দেশাবলীর মাধ্যমে শিক্ষার্থীদের কাছে উপস্থাপিত করবেন।	শিক্ষার্থীরা খেলায় অংশগ্রহণ করবে আনন্দ উপভোগ করবে এবং সাথে সাথে মৌমাছিদের প্রকারভেদ সম্পর্কে ধারণা লাভ করবে।

অনুসন্ধানী প্রশ্ন (Probing Questions)

প্রশ্ন	উত্তর
1) মৌমাছিদের সামাজিক পতঙ্গ বলা হয় কেন?	1) এদের মধ্যে শ্রমবন্টন ব্যবস্থা দেখা যাওয়ায় এদের সামাজিক পতঙ্গ বলে।
2) কাপড়ের উপরে বাটিক প্রিন্ট করার সময় যে মোম ব্যবহৃত হয় তা কোথা থেকে পাই?	2) শ্রমিক মৌমাছির পেটের নিচে অবস্থিত মোমগ্রন্থি থেকে নিঃসৃত রস বাতাসের সংস্পর্শে এসে মোমে পরিণত হয়, যা আমরা এ ক্ষেত্রে ব্যবহার করি।
3) মৌমাছি দেহের কোন অংশ ব্যবহার করে শত্রুকে আক্রমণ করে?	3) মৌমাছি (শ্রমিক) তার দেহের পশ্চাৎদেশে অবস্থিত হুল-এর সাহায্যে শত্রুকে আক্রমণ করে।

WORK SHEET :



শ্রমিক মৌমাছি



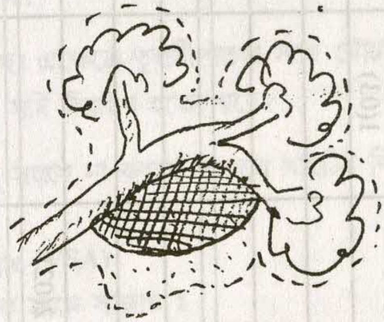
রাণী মৌমাছি



মোমবাতি



পুরুষ মৌমাছি



মৌচাক



মধু

চিত্র ঃ মৌমাছি ও তার ব্যবহারিক গুরুত্ব

উপরোক্ত চিত্রের ডট (....) চিহ্নিত অংশগুলি কেটে নিয়ে চিত্রগুলির cut-out শিক্ষার্থীদের দেওয়া হবে এবং তারা দল ভিত্তিক ভাবে প্রতিটির সম্পর্কে কিছু বক্তব্য লিপিবদ্ধ করবে।

ধারণা/বিষয়বস্তুর ব্যাখ্যাদানের জন্য উদাহরণ

ধারণা	উদাহরণ
1) মৌমাছিদের প্রকৃতি (অমেরুদন্ডী, সন্ধিপদী, সামাজিক পতঙ্গ)	1) মৌমাছি, পিঁপড়ে, উইপোকা ইত্যাদি
2) মধু সংগ্রহ, মধু সঞ্চয় এবং বাচ্চা মৌমাছি-দের লালন-পালন	2) শ্রমিক মৌমাছি।
3) মৌমাছি থেকে প্রাপ্ত উপজাত বস্তু	3) মধু, মোম।
4) মধুর ব্যবহার	4) পুষ্টিকর খাদ্য, জীবানু নিরোধক, সর্দি-কাশি নিবারণ করে। আয়ুর্বেদিক ওষুধে, প্রসাধন শিল্পে ব্যবচ্ছেদের ট্রে, দাঁড়ি কামানোর ক্রীম প্রভৃতি প্রস্তুতিতে।
5) মৌমাছির বিষ	5) বাত ও উচ্চ রক্তচাপের ওষুধ তৈরীতে।

CRITERION REFERENCED TEST (Based on objectives cited before)

উদ্দেশ্য ভিত্তিক অভিক্ষাপত্র

Table of Specification :

Concept/ Content	Form of Items	OBJECTIVES: Knowledge (Item/Mark)	Understanding (Item/Mark)	Application (Item/Mark)	Skill (Item/Mark)	Total No. of Items / Total Marks	Total No. of Items / % of Marks
1. প্রকৃতি	LA					–	1(10%)
	SA					–	
	VSA					–	
	OB	1(01)				1(01)	
2. সাধারণ পরচিতি	LA				1(03)	1(03)	4(70%)
	SA	1(02)				1(02)	
	VSA		1(01)			1(01)	
	OB		1(01)			1(01)	
3. প্রয়োজনীয়তা	LA					–	1(20%)
	SA					–	
	VSA					–	
	OB			2(02)		2(02)	
Total No. of Items / Total Marks		2(03)	2(02)	2(02)	1(03)	7(10)	7(100%)
Weight of marks (%)		30%	20%	20%	30%	100%	

[**N.B.** LA–Long Answer, SA–Short Answer, VSA–Very short Answer, OB–Objective]

TEST ITEMS

F.M.–10
Time–25 Min.

সকল প্রশ্নের উত্তর দাও ঃ (1x4) = 4

Objective type (ob)

1. সঠিক উত্তরটি চিহ্নিত কর ঃ
   মৌচাক তৈরী হয়—লালারস দিয়ে/মোম দিয়ে/পাতা দিয়ে/কোনটিই নয় ....(U)

2. মৌমাছি কি জাতীয় পতঙ্গ? ....(K)

3. একটি শিশুর সর্দি হয়েছে। এক্ষেত্রে তুলসীপাতার সঙ্গে মৌচাক থেকে প্রাপ্ত কোন জিনিসটি ব্যবহার করলে শিশুটির সর্দি নিরাময় হতে পারে? ....(A)

4. মৌমাছি ফুল থেকে মধু সংগ্রহ না করতে পারলে গাছটির কি ক্ষতি হতে পারে? ....(A)

(1x1) = 1

Very Short Answer type (VSA)

5. নিচের দশাগুলিকে সঠিক ক্রমে সাজাও ঃ
   a) লার্ভা, b) ডিম, c) পূর্ণাঙ্গ, d) পিউপা ....(U)

(2x1) = 2

Short Answer type (SA)

6. শ্রমিক মৌমাছির কাজগুলি কি কি? ....(K)

(3x1) = 3

Long answer type (LA)

7. রাণী মৌমাছির চিত্র অংকন করে নিম্নলিখিত অংশগুলি চিহ্নিত কর ঃ
   i) মস্তক; ii) ডানা ....(SK)

PEDAGOGICAL ANALYSIS

No. : 07

Prepared by :

Swarup Kumar Maity
&
Sudipta Sarkar

SUB-LIFE SCIENCE

CONTENT ANALYSIS

UNIT : Outline idea and importance of the some animals.

Class–VII

Sub-units	**No. Of Periods**
1. General idea & importance of Fish	01
2. General idea & importance of Silk worm	01
3. General idea & importance of Honey bee	01
4. General idea & importance of Poultry birds	01
	Total 04

ANALYSIS OF SUBMIT 2

Selected Submit : General idea & importance of Silk-worm

Briefly Summary of Concept :

Concepts	Summary
(1) Definition of Silk worm	(1) Silk worm is regarded as beneficial animal (insect) because it produces very beautiful and costly silk fibre. Silk is produced from the saliva secreted from the silk gland of the larva. The larva is known as silkworm.
(2) Types of Silk	(2) In our country four varieties of silk is produced by rearing silk moths of different kinds, they are mulberry silk, tasar silk, muga silk and eri (endi) silk.

Concept	Summary
(3) Introduction of Mulberry Silk	(3) Mulberry silk is the commonest and best quality silk. It is obtained by rearing Mulberry silk worm (*Bombyx mori*). It is so named because the larva of this silk moth feed mulberry leaves. Life history of silk moth is divided into four stages, such as egg larva, pupa & adult.
(4) Importance of Silk	(4) • Clothes are produced from silk • Silk clothes are used in all seasons. • Pupa of silk moths are used as food for the poultry birds and fishes. • Excreta of silk moth are used as manure for the land. • It is also used in the parachute manufacture

Previous Knowledge/Learning

1. The students are very familiar to silk-cloth. They have already idea about silky-dresses.
2. They are very concerned about larval or pupa-stage of insect.

OBJECTIVES :

1) Cognitive :

a) Knowledge :

(i) The students will be able to recall the names of some silkworms.

(ii) They will be able to state the importance of silk.

b) Understanding :

(i) The students will be able to explain about uses of silk.

(ii) They will be able to compare the different types of silks with cotton.

(iii) They will be able to identify the different silkworms and silks.

c) Application :

(i) The students will be able to describe about different silk-moths.

(ii) They will be able to suggest some uses of silks and silkmoths.

2) Affective :

(i) The students will be interested to collect different silk through fieldwork.

(ii) The students will show interest to observe different silks.

(iii) They will sponteneously investigate about the alternate uses of silk.

3) **Psychomotor :**

(ii) The students will be able to draw the diagram of life cycle of a silk moth.
(ii) They will be able to prepare a chart of classfication of fish.

TEACHING STRATEGIES

Broad method of Teaching

Concepts	Method
i) Definition of silk worm ii) Types of silk. iii) Introduction of mulberry silk. iv) Importance of silk	i) Lecture cum interaction method. ii) Lecture cum demonstration through chart. iii) Lecture cum demonstration method. iv) Lecture cum demonstration cum interaction method.

Equipments :

(i) Chalk (ii) Duster, (iii) A previously prepared chart showing the different types of silkmoths with examples. (iv) Cocoon, silk cloths.

Demonstration/Students activity :

i) Different types of silks will be demonstrated.
ii) The students will be engaged in a discussion regarding different uses of silkmoth.

Use of chalk/Board :

The names of different types of silk moths and their scintific names will be written on the blackboard, various keywords should be written on the blackboard.
A labeled diagram of life cycle of a silk-moth will be drawn on blackboard.

Probing Questions with brief answers.

Questions	Answers
i) What are the important features of Mulberry silk?	i) Mulberry silk is the commonest and best and best quality silk. This silk is very soft & costly
ii) From where silk is produced?	ii) Silk is produced from the saliva secreted from the silk gland of the larva of silk-moth.
iii) Distinguish between larva & pupa of silk moth.	iii) Larva of silkmoth is the pre-stage of pupa and pupa is post stage of larva. This larva is modified into cocoon and that is called pupa.
iv) Distinguish between cotton and silk	iv) Cotton is produced from plant product but silk is produced from insect saliva.

WORKSHET :

The students will be asked to write down the answers of the following items in their note-book in the classroom.

1) **Match the following :**

Silk	Silk Moth
Mulberry silk	_Anthereria_ _assamensis_
Maga silk	_Bombyx_ _mori_
Eri (endi) Silk	_Antherenia_ _mylitta_

2) **Fill in the blanks :**

Silk is secreted from .... of silk moth.

EXAMP]LE TO ILLUSTRATE CONCEPTS :

Concepts	Example
Different types of silk	Mulberry, tasar, muga, eri(endi)
Different silk moths	_Bombyx_ _mori_, _Anthereria_ _assamensis_.
Different uses of silk moths	Clothes, parachute etc.

CRITERION REFERENCED TEST

Objectives/ Concepts	Knowledge (K)	Understanding (U)	Application (A)	Skill (SK)	Total No. of Items	Total Marks
Definition of Silkworm	01(01)				01	(01)
Types of Silk		01(1)			01	(01)
Introduction of Mulberry of silk	01 (01)		01(02)	01(04)	02	(06)
Importance of silk	01(01)	01 (01)			02	(02)
Total No. of items / Total Marks	02 (02)	02(02)	01(02)	01(04)	06	(10)
%	20%	20%	20%	40%		100%

TEST ITEMS

Answer all the questions : **F.M = 10**

1. Name one example of silkmoth ....(K)
2. Give one dissimilarity between Mulberry and Tasar Silk. ....(U)
3. Describe the nature of Mulberry silk ....(A)
5. Name any one type of Silk ....(K)
6. Compare between silk & cotton in terms of uses ....(U)

PEDAGOGICAL ANALYSIS

No. : 08

Prepared by : **Mr. Kaustuv Bhattacharyya (Lecturer)**
Govt. College of Education, Banipur

CONTENT ANALYSIS

Unit : Medicinal Plants **Class : VII**

Sub-Units	**No. of Periods**
1. General idea on Medicinal plants, Tulsi and Neem	01
2. Sarpagandha and *Cinchona*	01
3. *Penicillium*	01
	Total = 03
	Evaluation 01
	Reteaching 01
	Sum total 05

ANALYSIS OF THE SUBUNIT

Sub-Unit : General idea on Medicinal Plants, Tulsi and Neem.

Brief summary of concepts

Concept	Summary
1. Definition of Medicinal plants with a general idea on various types of Medicinal Plants.	1. Plants having healing or curative properties are known as Medicinal plants. Plants from every group of the plant kingdom have certain medicinal importance. Thus, there are algae, fungi, bacteria, bryophyta, pteridophyta, gymnosperms and angiosperm having highly acclaimed medicinal importance.
2. Tulsi a general discussion	2. A small dicot shrub having hairs on its entire body. Serrated leaves are oval in shape and tangentially oriented. Flowers are formed in a group on the rachis. Scientific name–*Ocimum sanctum.*

Concept	Summary
3. Neem-a general discussion	3. A perennial, dicot tree having compound leaves where the leaflets are serrated. Flowers are small and white in colour. Fruits are greenish in colour. Scientific name–*Azadirachta indica.*
4. Medicinal importance of Tulsi and Neem	4. The whole plant of Tulsi is medicinally important. Leaf extract is used to treat cold, nausea, alimentary disorders diabetes, arthritis etc. Leaves & bark of Neem are mainly used for medical purposes with their active principles–nimbin, nimbidin etc. Leaf extract or whole leaves are used to treat several skin diseases, bark extract is used to cure gastro-intestinal diseases.

Previous Learning :

(1) The students know the external features of plants.
(2) They know that both Tulsi and Neem-plants grow in their surroundings.

OBJECTIVES :

● **Cognitive :**

A) Knowledge :

(i) The learner will be able to define a Medicinal plant.
(ii) They will be able to recall the scientific names of Tulsi and Neem.
(iii) They will be able to name the useful parts of Tulsi and Neem for medical purposes.

B) Comprehension :

(i) Students will be able to distinguish between the external features of Tulsi and Neem.
(ii) They will be able to explain the validity of considering Tulsi and Neem as Medicinal Plants.

C) Application :

The students will be able to identify other Medicinal Plants from their surroundings on the basis of their uses.

● **Affective :**

The learners will be interested about various medicinal plants and their uses.

- **Psychomotor** :

  The students will be able to draw and label both Tulsi and Neem.

WORKSHEET

The students will be asked to write down the answers of the following items mentioned in the worksheet.

(1) Why Tulsi is a Medicinal Plant?

(2) Choose the correct answer from the following :

Scientific name of Neem is–(a) *Mangifera indica*, (b) *Rauwolfia serpentina*, (c) *Ocimum sanctum*, (d) *Azadirachta indica*.

TEACHING STRATEGIES

Broad method of Teaching :

Concept/Content	Method
1. Definition of Medicinal Plants with a general idea on various types of Medicinal Plants.	1. Lecture method.
2. Tulsi–a general discussion.	2. Lecture cum demonstration method.
3. Neem–a general discussion.	3. Lecture cum demonstration method.
4. Medicinal importance of Tulsi and Neem	4. Lecture method.

Teaching Equipments :

Equipments	Use
1. Chalk, duster and other classroom equipments.	Different key words and key concepts, along with necessary drawings are depicted on the black-board with their explanations.
2. Coloured pictures of Tulsi and Neem with proper labellings.	Reference to the coloured pictures are done whenever situation arise.

Illustration/Examples/Experimentation/Activity

.	Teacher's activity	Students' activity
Demonstration	The teacher will discuss the morphological characters of Tulsi and Neem with the use of herberium sheets of these plants along with an optimum number of live specimens. Sumultaniously he/she will advance the lesson using appropriate questions and answers.	The students will minutely observe the herberium-sheets and the live specimens and ask timely questions along with answering the questions put forward by the teacher.

PROBING QUESTIONS :

Questions	Answer
1. Why should we study the topic– 'Medicinal Plants'?	1. Plants are all around us, and if we know medicinally important plants of our surroundings, along with their uses, then we can use them to cure or heal out diseases with minimum side effects.
2. What is the utility to know the medicinal importance of Tulsi and Neem.	2. Tulsi and Neem are among the most naturally occurring plants. As such, if we know their medicinal uses then we can easily use and conserve them.

EXAMPLES TO ILLUSTRATE THE CONCEPTS/CONTENTS

Concept/Content	Examples
1. Definition of Medicinal Plants.	1. Vasak, Kalmegh have uses to heal or cure certain diseases. As such, these are medicinal plants having medicinal uses.
2. General discussions on Tulsi and Neem.	2. China-rose is a shrub having serrated leaves. Mango tree is a perennial plant as it has a life-span of many years.

CRITERION REFERENCED TEST

Objective / Concepts	Know-ledge	Compre-hension	Appli-cation	Skill	Total no. of items	Total Marks	Total Percentage of Weightage on each content
Defenition of Medicinal plants with a gonend idea on vari-ous types of Medicinal Plants	01(01)	–	01(01)		02(02)		33.33%
Tulsi-a general discussion	–	–	–	01 (04)	01(04)		16.67%
Neem-a general discussion	–	01(02)	–	–	01	(02)	16.67%
Medicinal importance of Tulsi and Neem	01(01)	01(01)	–	–	02	(02)	33.33%
Percentage of weightage on each objective	20%	30%	10%	40%	06	(10)	100.00%

Full Marks–10
Time – 15 Mins

TEST ITEMS

1. Define medicinal plant ....(K)
2. Compare between the morphological structures of Tulsi and Neem ....(U)
3. Find an example of a medicinal plant from your locality apart from which are included in your syllabus ....(A)
4. Which medicinal-plant is used to treat skin-diseases? ....(K)
5. Analyse the reasons for giving Tulsi a special status in our culture ....(U)
6. Draw a labelled-sketch of a twig of Tulsi ....(Sk)

PEDAGOGICAL ANALYSIS

No. 09

Prepared by : Sunita Keyriwal (Lecturer)
Surendra Lal Teachers' Training College,
Bally, Howrah

Subject : Life Science

CONTENT ANALYSIS

UNIT : Characteristic features of Animals **Class–VII**

Sub-Units	**No. Of Period**
1. Introduction of Animals and Phylum protozoa and Porifera	1
2. Phylum coelenterata and ctenophora	1
3. Phylum platyhelminthes thes and phylum Aschelminthes thes	1
4. Phylum Annelida and phylum Arthopoda	1
5. Phylum Mollusca and phylum Echinodermata	1
6. Phylum Chordata	1

Total : 6
Evaluation : 1
Retaching : 1

Sum Total : 08 Periods

ANALYSIS OF SUB-UNIT

Sub-unit : Phylum Annelida and Arthropoda

Brief Summary of Concept of Matter

Concept/Content	Brief Summary
Phylum Annelida	Annulus means ring and eidos means form. They are mostly aquatic, marine or freshwater, burrowing or living in tubes. Most hermaphrodite mouth and anus at opposite end.
Phylum Arthropoda	Arthro means jointed, poda mean foot. It has jointed appendages, segmented body and segments are joint by arthrodial membrane.

Previous Learning/Knowledge :

1) The students have observed Cockroaches and Earthworms in their home and surroundings.
2) The students are acquainted with external features of cockroach in Class VI

OBJECTIVES :

1. Cognitive :

a) Knowledge :

i) The students will be able to recall the various organisms of phylum Annelida and Arthropoda.

ii) They will be able to state the characteristics features of Annelida and Arthropoda.

b) Understanding :

i) The students will be able to distinguish between the organisms of Arthropoda and Annelida.

ii) The students will be able to explain why earthworm belong to Annelida and why cockroaches in Arthropoda.

c) Application :

i) The students will be able to indentify various organisms belonging to Annelida and Arthropoda.

2) Affective :

i) The students will show more interest to know about various animals, insects in nature.

3) Psychomotor (Skill) :

i) The students will be able to label various parts of Earthworm and Prawn.

ii) The students will be able to draw Earthworm and Prawn.

TEACHING STRATEGIES

Broad Method of Teaching

Concept	Method
1. Phylum Annelida	By Lecture, Display and Demonstration method
2. Phylum Arthropoda	By Lecture, Display and Demonstration method

TEACHING EQUIPMENTS

1. Model of prawn.
2. Museum specimen of Prawn and Earthworm.
3. Usual classroom aids.

DEMONSTRATION/EXPERIMENTATION/ILLUSTRATION/ACTIVITY

The museum specimen of Prawn and Earthworm will be displayed and demonstrated.

USE OF CHALK

1) The key characteristic features of Anthropoda and Annelila will be written on the board.
2) Earthworm and prawn will be drawn on the board.

Probing questions with brief answers :

1. Why earthworms are known as friend of farmers?

Ans. Earthworms are known as friend of farmers because they improve the fertility of the soil which helps in agriculture.

2. Why the body cavity of prawn is called haemocoel?

Ans. The body cavity of prawn is filled with blood so it is called haemocoel.

WORK SHEET

1) Write scientific names of
   a) Cockroach
   b) Prawn
   c) Earthworm
   d) Leech.

2) Match the followings

i) Chelate leg	a) Earthworm
ii) Clitellum	b) Prawn
iii) Annuali	c) Annelida
iv) Exoskeleton	d) Arthropoda

EXAMPLES TO ILLUSTRATE CONCEPTS/CONTENTS

Concept/Content	Examples
1. Phylum Annelida	(i) Earthworm, (ii) Leech, (iii) Sandworm, (iv) Seamouse
2. Phylum Arthropoda	(i) Cockroaches, (ii) Prawn, (iii) Spider, (iv) Crab, (v) Grasshopper, (vi) beetle.

CRITERION REFERENCED TEST

Table of Specification

Objectives / Concept	K	U	A	S	Total No. of Marks / Total No. Items
Annelida		1(2)		3(5) 3(6)	7(3)
Arthropoda	1(1)	1(4)	1(3)		3(3)
Total marks Total items	1(1)	2(2)	1(1)	6(2)	10(6)
Weightage of marks %	10%	20%	10%	60%	100%

[The figures in the parathesis indicates Q No. and outside is the marks]

TEST ITEMS

1. Give the one characteristic feature of Arthropoda (K) 1
2. Write any one dissimilarity between Annelida and Arthropoda (U) 1
3. Give one example of Arthropoda which is not cited above (A) 1.
4. Find one harmful insect. (U) 1

   i) prawn, ii) crab, iii) cockroach, iv) None.
5. Draw a neat diagram of Earthworm (S) 3
6. Label i) clitellum, ii) Seta, iii) Anus (S) 3

PEDAGOGICAL ANALYSIS

No. 10

Prepared by : Mrs. Mili Mishra (Lecturer in Botany)
Dr. Supatra Sen (Lecturer in Botany)

SUBJECT : LIFE SCIENCE

CONTENT ANALYSIS

UNIT : Fruit and Seed Class–VII

Sub-Units	**No. Of Period (s)**
1. Definition and Structure of fruit, e.g. Mango.	1
2. Definition and structure of a dicot seed e.g. Pea.	1
3. Definition and structure of a monocot seed e.g. Maize	1
4. Germination of seed	1
	Total : 4

ANALYSIS OF SUB-UNIT

Selected Sub-unit : 2. Definition and Structure of dicot seed e.g. Pea

2. i) Definition of seed
   ii) Types of seed
   iii) Structure and function of a dicotyledonous seed e.g. Pea.

Brief Summary of Concepts :

i) Seed is the fertilized, mature and ripe ovule bearing the embryo, present within the fruit of a flowering plant.

ii) There are 2 types of seeds, namely
   a) Dicotyledonous seed e.g. Pea.
   b) Monocotyledonous seed e.g. Maize.

iii) In dicot seeds, there are two cotyledons present within the seed.

iv) Parts of a dicot seed are :–
   a) Seed coat
   b) Hilum
   c) Micropyle
   d) Kernel– ● Cotyledons
   ● Tigellum.

Previous Knowledge/Learning :

i) The students already know about the structure and function of flowers.
ii) The students know already that the ovary of the flower transforms into the fruit and ovules into seed after fertilization.
iii) The students are familiar with some common fruits like mango, grapes, oranges and have also seen peas during the winter season.
iv) Students have already learnt about the definition and structure of a Mango fruit.

OBJECTIVES :

1. Cognitive

a) Knowledge : (K)

i) The students will be able to **define** a seed.
ii) They will be able to **name** the two types of seeds.
iii) They will be able to give an **example** of a dicot seed.
iv) They will be able to **recall** the different parts of a dicot seed.

b) Understanding : (U)

i) The students will be able to cite **examples** of other dicot seeds.
ii) They will be able to **explain** the necessity of the seed coat.
iii) They will be able to **distinguish** between hilum and micropyle.

c) Application : (A)

i) They will be to **predict** the consequence in case the cotyledons are absent.
ii) They will be able to **establish a relation** between shoot and plumule and root and radicle.

2. Affective :

i) The students will be **appreciative** of the fact that seeds are the bearers of life.
ii) They will spontaneously **participate** in conservation of different kinds of seeds.

3. Psychomotor :

i) The students will be able **to draw** a well labelled diagram of a pea seed.
ii) They will be able to **construct** a flow chart showing the parts of a dicot seed.

TEACHING STRATEGIES

Broad Method of Teaching	Method used
i) Definition and types of seeds	Interactive Lecture Method.
ii) Structure and Function of Pea Seed	Lecture-cum-demonstration method.

Equipment :

(i) Chalk, (ii) Duster, (iii) Blackboard, (iv) Chart showing the structure of Pea Seed. (v) Live specimens of two types of seeds.

Demonstration/Display/Experimentation/Students' Activity/Group Activity.

- Demonstration of live specimens of two types of seeds.
- Display of chart showing structure of pea seed.
- Students' Activity comprising of collection of different kinds of seeds.
- Group Activity comprising of a discussion regarding different methods of seed conservation.

Use of Software :

A powerpoint presentation Shouring the structure and associated functions of pea seed.

Use of Chalk/White Board :

- Definition of seed
- Two types of seeds
- Schematic Representation of parts of a Pea seed.

Probing Questions with Brief Answers :

1) What would be the consequence if the radicle of the seed is damaged?

   Ans. The tap root system would fail to develop.

2) What is the outcome if the micropyle is blocked?

   Ans. The passage for the entry of water and oxygen would be obstructed.

WORKSHEET

The students will be asked to match the following items in their notebook in the class room

Parts	Function
Seed coat	Acts as a passage for water & oxygen entry.
Hilum	Supplies food to growing seedling.
Micropyle	Protects the embryo
Cotyledon	Gives rise to shoot.
Plumule	Indicates the point of attachment of stalk with seed.

Examples to Illustrate Concepts/Content

Content	Example
Dicot Seed	Pea, Gram, Bean
Seed coat	Human Skin
Kernel	Coconut
Nodal Zone/point	Point of attachment of leaf

CRITERION REFERENCED TEST
(Based on objectives cited before)

TABLE OF SPECIFICATION

Objectives / Content	K Item (Mark)	U Item (Mark)	A Item) (Mark)	S Item (Mark)	Total No. of Items / Total Marks
Definition of seed	1(1)				01, (01)
Types of Seed	1(1)				01, (01)
Structure & function of pea seed	1(1)	1(2)	1(2)	1(3)	04, (08)
Total no. of Items / Total Marks	(03) / (03)			(01) / (03)	(06) / (10)
Weightage of Marks in %	30%	20%	20%	30%	100%

TEST ITEMS : (Frame at least six items)

Answer all the items. **F. M = 10**

1. Fill in the blanks (K)........... (1)
   ______ supplies food to the growing seedling.
2. Define seed. (K)........... (1)
3. Name the two types of seed. (K)........... (1)
4. Differentiate between hilum & micropyle. (U)........... (2)
5. Predict the consequence in case the seed coat is damaged. (A)........... (2)
6. Draw a neat diagram of a dicot seed showing the seed coat, hilum and cotyledons (sk)........... (3)

PEDAGOGICAL ANALYSIS

No. 11

Prepared by : Nivedita Talukder, Lecturer, Kolkata Teachers Training College, Kakinara.

CONTENT ANALYSIS

SUBJECT : LIFE SCIENCE

UNIT : Characteristic feature of Animals .

Class : VII

Sub-units	**No. of periods**
1. Introduction about animals and Phylum Protozoa and Porifera	1
2. Phylum Coelenterata & Ctenophora	1
3. Phylum Platyhelminthes & Phylum Aschelminthes	1
4. Phylum Annelida & Arthopoda	1
5. Phylum Mollusca & Phylum Echinodermata	1
6. Phylum-Chordata	1
	Total 06
	Remedial Teaching 01
	Total 08 periods

ANALYSIS OF SUB-UNIT

Sub-unit : Phylum Annelida and Phylum Arthropoda.

Brief Summary of Concepts

Content/Concepts	Summary
Phylum–Annelida	Elongated ring like segmented cylindrical worms. Moves by setae e.g. Earthworm
Phylum-Arthropoda	**'Arthros'** means jointed and **'podos'** means legs. Externally segmented body, jointed legged animals. Body divided into head, thorax and abdomen, sometimes into Cephalothax and abdomen. The body is externally covered by a chitinuous exoskeleton.

Previous Learning :

1. The students have seen earthworms during rainy season.
2. They have also seen cockroaches at their homes.
3. They are acquainted with the external features of earthworm and cockroach.

OBJECTIVES :

Cognitive :

Knowledge :

1) The students will be able to identify earthworm and cockroach.
2) They will be able to name the different body parts of earthworm and cockroach.
3. They will be able to state the different functions of the body parts.

Understanding :

1) The students will be able to compare the Phylum Annelida and Phylum Arthopoda.
2) They will be able to explain why cockroach is placed under-Phylum-Arthropoda.
3) They will be able to differentiate between Earthworm and Cockroach.

Application :

1) The students will be able to find out different organisms which fall under Phylum-Annelida and Phylum Arthropoda.
2) They will be able to establish relationship among various animals which are found around them.

Affective :

1) The students will become interested in collecting various organisms which they see around them.
2) They will be motivated to keenly observe their body parts and their characteristics.

Psychomotor :

1) They will be able to draw an earthworm and a cockroach.
2) They will be able to label the different parts of both the animals.

TEACHING STRATEGIES

Broad method of Teaching

Concepts	Methods
Phylum-Annelida	Lecture and Demonstration method
Phylum–Arthropoda	Lecture and Demonstration method.

Teaching Learning Materials (with uses) :

1. General equipments of a classroom like chalk, duster, blackboard etc.
2. Charts showing pictures of earthworm and cockroach will be displayed in the classroom for giving a clear idea to the students.
3. Museum specimen of Earthworm and live specimen of Cockroach will be shown in front of the students and each external features will be mentioned.

Use of Chalk/White Board :

1. The key characteristic feature of Arthropoda and Annelida will be written on the board.
2. Diagram of Earthworm and cockroach will be drawn on the board and labelling of the various parts will be done.

Probing questions with brief answers

Q.1. Why earthworms are known as friend of farmers?

Ans. Earthworms are known as friend of farmers because they improve the fertility of soil through aeration.

Q.2. Why 'Housefly' is placed under phylum Arthropoda?

Ans. Because they also have jointed legs.

WORK-SHEET

1. Write down the scientific names of the followings :
   a) Cockroach–
   b) Earthworm
   c) Leech–
   d) Housefly–

2) Match the followings :

i) Chelate leg	(a) Earthworm
ii) Clitellum	(b) Prawn.
iii) Annuli	(c) Annelida
iv) Exoskeleton	(d) Arthropoda.

Examples to Illustrate Concepts/Content

Concept/Content	Examples
1. Phylum–Annelida	i) Earthworm ii) Leech iii) Sandworm iv) Sea mouse
2. Phylum–Arthropoda	i) Cockroach ii) Prawn iii) Housefly iv) Beetle v) Grasshoppar

CRITERION REFERENCED TEST
Table of Specification

Objectives / Concept	K	U	A	S	Total No. of Marks / Total No. Items
Annelida		1(2)		3(5)	8(4)
Arthropoda	1(1)		1(3)		2(2)
Total Mark / Total Items	1(1)	2(2)	1(1)	6(2)	10(6)
Weightage of marks (%)	10%	20%	10%	60%	100%

TEST ITEMS

F. M. = 8

1. Give one characteristic feature of phylum Arthopoda (K) 1
2. Mention one dissimilarity between Annelida and Arthropoda (U) 1
3. Give one example of Arthropoda which is not mentioned in the class room teaching (A) 1
4. Why Leech is called a hermaphrodite animal (U) 1
5. Draw a neat diagram of earthworm (S) 1
6. Label the following parts of the above mentioned animal (S) 3
   (a) Clitellum
   (b) Seta
   (c) Anus.

PEDAGOGICAL ANALYSIS

No. 12

Prepared by : Mrs. Trisha Banerjee, Lecturer
A.J.C. Bose College, Kolkata

Subject : Life Science

CONTENT ANALYSIS

Unit : Organs and Systems of animal

Class : VII

Sub-units	**No. of periods**
1. External features of Toad	01
2. Alimentany system of Toad	01
3. Circulatory system of Toad	02
4. Respiratory system of Toad	01
5. Excretory system of Toad	01
6. Reproductive system of Toad	02
7. Nervous system of Toad	01
	Total = 09

ANALYSIS OF SUB-UNIT

Selected Sub-unit : Digestive system of Toad

Concepts	Summary
1. Definition of Digestive-System	The system which is concerned with the intake of food,its digestion, absorption and elimination of undigested products constitute the Alimentary or Digestive-System
2. Different parts of Digestive-System	Alimentary canal and digestive glands.
3. Alimentary canal	Alimentary canal is a long tube which starts from mouth and ends in cloacal aperture. It consists of mouth, buccal cavity, pharynx, oesophoyes stomach, small intestine, large intestine, rectum, cloaca.

Concepts	Summary
4. Digestive gland	These are (1) **Liver** dark brown colured divided into right and left lobe. Middle segment is green coloured called gall bladder, which stores bile secreted from liver. (2) **Pancreas,** found at the junction of stomach and duodenum. (3) **Intestinal gland,** situated in the inner wall of ileum and it secret digestive engymes.
5. Functions of various parts of digestive system	Mouth cavity–ingestion and swallowing of food. Oesophageus–Sending the food to stomach. Stomach–digestion of food. Duodenum & ileum = digestion & absorption L.I. = Rectum + Cloaca = Egestion. Liver : Scretion of bile Pancreas : secretion of digestive juice.

Previous Learning :

1) The learner knows the structure of toad.
2) They have the knowledge on different parts of body & systems of toad.
3) They have the idea about digestive system which takes part in digestion of food.

OBJECTIVES :

1. Cognitive :

a) Knowledge :

i) The students will be able to recall the definition of the digestive system of toad.
ii) They will be able to state the different parts of digesctive system of toad which helps in digestion of toad.

b) Understanding :

i) The students will be able to distinguish between the process of food intake in toad and man.
ii) They could compare the functional role of man and toad, in respect to digestive system.
iii) They could relate the different functions of different enymes on different food.

Application :

i) They will be able to analyse the functions of different digestive glands.
ii) They will be able to arrange systematically steps of digestion in toad.
iii) They will be able to draw conclusions regarding the digestion of insectivorous animals.

2. Affective :

i) The students will spontaneously participate in controlling harmful insects by using insectivorous animals (Biological control)

ii) The student will take part in conservation of toad.

3. Psychomotor :

i) The students will be able to draw and label the diagram of toad.

TEACHING STRATEGIES

Broad method of Teaching

Concepts	Methods
(1) Definition of digestive system	Lecture cum interactive method.
(2) Different parts of digestive system	Lecture cum demonstrative method through charts
(3) Alimentary cannal and digestive gland	Display of model and lecture
(4) Functions of digestive system	Lecture and flowchart.

Equipments :

1) Chalk, Duster, Blackboard, Model, Chart

Demonstration :

The teacher can dissect and display the digestive system of toad and the students can have an overview of different parts in detail.

BOARDWORK :

Digestive System of Toad

- Alimentary canal
  - Mouth
  - Oesophagus
  - Stomach
  - S.I.
  - L.I.
  - Rectum + Cloaca
- Digestive gland
  - Liver
  - Pancreas
  - Gastric gland
  - Intestinal gland.

Probing questions with brief answers

Q.1. Why food is not digested in buccal cavity of toad?

Ans. There is no salivary gland in mouth, therefore no digestive engyme is secreted in mouth, thus no digestion occurs.

Q.2. What is the peculiarity of tongue in toad?

Ans. The tongue is fixed anteriorly and being free posteriorly. It helps to capture the prey by throwing the tongue.

WORKSHEET :

The students will be able to write the answers of the following items.

Fill in the blanks :

1) The alimentary system of toad consist of alimentary cannal and ——.
2) Alimentary canal consists of —— buccal cavity.
3) Liver stores ——.

Examples to Illustrate Concepts/Content

Concept/Content	Examples
Definition	As human beings and other higher animals have digestive system toad also has specific type of digestive system.
Alimentary cannal	Like human being the toad also has digestive gland containing bucal cavity oesophogus, stomach, small intestine, large intestine.
Digestive Gland	Like human being toad has liver & pancreas as digestive gland but unlike human being salivary gland is absent in toad.
Functions	As solid & complex food becomes soft & simple by cooking, similarily in digestive system of toad solid & complex food becoms absorable food substance.

CRITERION REFERENCED TEST
Table of Specification

Objectives / Concept	K	U	A	S	Total No. of Questions / Percentage
Definition	1 (01)				1 (16.66)
Digestive Canal	1 (02)			1 (o5)	2 (33.32)
Digestive Gland			1 (04)		1 (16.66)
Function		1 (03)	1 (05)		2 (33.32)
Percentage	2(33.32)	1(16.66)	2(33.32)	1(16.66)	6 (100) 100

[In bracket Q. No. of the test items given]

TEST ITEMS

1. How many parts are there in the digestive system of toad?
2. How many parts are there in the alimentary canal of toad?
3. In which part of alimentary canal the digested food materials are absarbed?
4. Which digestive glad is responsible for the secretion of proteolytic engymes in case of tood.
5. What is the necessity of digestive system?
6. Draw a labelled diagram of digestive system of toad.

PEDAGOGICAL ANALYSIS

No. 13

Prepared by : Mrs. Lina Sarkar (Lecturer)
Mrs. Trisha Banerjee (Lecturer)

Subject : Life Science

CONTENT ANALYSIS

Unit : Organs and Systems of animal   Class : VII

Sub-units	**No. of periods**
1. Toad–External features	01
2. Structures and functions of Alimentary system of toad	02
3. Structures and functions of Circulatory system of toad	02
4. Structure and function of Respiratory system of toad	01
5. Structure and function of Excretory system of toad	01
6. Structure and function of Reprductive system (Male & Female) of toad	02
7. Structure and function of Central Nervous system of toad	01
	Total = 10 periods

Analysis of Sub-unit

Selected Sub-unit : Stucture and function of Respiratory system of toad.

Brief Summary of concepts or` matter :

1. Respiration is the only process through which organism get energy.
2. Respiration may be if aerobic & anaerobic type.
3. Aerobic respiration occurs in presence of free molecular oxygen.
4. Chief respiratory organ of terrestrial animal is lung.
5. Respiratory system is consist of lung, external & internal nares, laryngotracheal chamber, bronchus etc.
6. In toad there are three types of respiration found and they are pulumonary respiration, cutaneous respiration & buccopharyngial respiration.
7. In toad, alveolus is formed from the invagination of inner layer of pleura.
8. In toad, stages of pulmonary respiration are different from human beings.
9. In toad, stages of pulmonary respiration are asspiration, expiration and inspiration.

10. As buccopharynx is enriched with blood vessels thus it also helps in respiration.
11. As the skin of toad is naked, moist, glandular enriched with blood capilaries & this it also help in respiration.

Previous knowledge/Learning :

(i) The students have seen toad in their sourroundings.
(ii) The students are already aware of respiration process.
(iii) It is also known to the students that without respiration no one can survive.
(iv) Students already know that plants have no definite respiratory organs.
(v) Students also know that in each and every animal there are specific respiratory organ.

OBJECTIVES :

1. **Cognitive**

a) **Knowledge :**

i) Students will be able to define respiratin.
ii) They will be able to recall three kinds of respiratory mechanism in toad.
iii) They will be able to state the different stages of pulmomary respiration.

b) **Understanding :**

i) The students will be able to explain how the toadpole respires in water.
ii) The students will be able to distinguish between pulmomary respiration and respeiration by gills.
iii) They will be able to compare the mode of pulmonary respiration of man and toad.

c) **Application :**

i) Students will be able to tell what will happen if a toad is kept in a air tight container.
ii) The students will be able to predict the important role of O_2 in respiration.
iii) Students will be able to tell what will happen if jaws of a toad kept open by pulliping a match stick in the mouth.
iv) They will be able to relate between the role of free molecule, O_2 & dissolved O_2 in respiration and they will also be able to suggest some innovative method for increasing toad population.

2. **Affective** (Interest, value, attitude etc.)

i) The students will spontaneously participate in increasing toad population by making sure that no as such hazards are caused by toad.
ii) The students will show interest to make sourrondings free of agents that are harmful to toad.
iii) The students will show interest to know the ecological niche of toad.

3. **Psychomotor :**

i) The students will be able to draw the labelled diagram of external features and respiratory system of toad.

TEACHING STRATEGIES

Broad Method of Teaching :

i) By interactive lecture method, the students should be provided information about the habit & habitat of toad and also about the different types respiratory process found in toad.

ii) Through lecture cum demonstration method, the students should be provided with the information about the different stages and pathways of the respiratory system.

Equipments :

(i) Chalk, (ii) Duster, (iii) Blackboard, (iv) A previously prepared chart showing the different stages of pulmonary respiration in toad. (v) Animated film showing the process of pulmonary respiration.

Demonstration/Display/Experimentation/Students activities/Group activity :

A preserved jar specimen showing external features of toad.

The students will be engaged in a discussion regarding specificity of respiratory process in toad. The remarkable movements of the lower jaw that helps in the process of pulmonary respiration.

Use of Chalk/Black Board :

The names of three different stages of pulmonary respiration as well as three different types of respiration process will be written is a tabular form on the black board. Berides various keywords should be written on black board.

Probing questions with brief answers

Q.1. What will happen if a toad's jaws are kept open by a match stick for few hours?

Ans. It will die, because if the movement of lower jaw is stopped then O_2 will not enter in the lungs.

Q.2. Why hibernation is found in toad?

Ans. Due to the lowering in temperature and as toads are cold blooded, thus to keep warm they hibernate.

Q.3. Why toads are mainly found in moisture?

Ans. As their skin is moist naked, glandular and well vascularised, thus moisture helps in cutaneous respiration.

WORKSHEET :

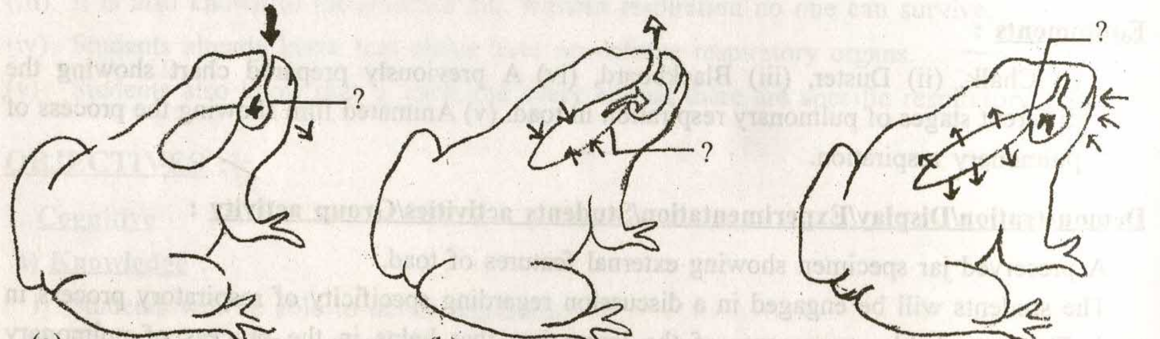
The students will be asked to write down the answers of the following items in their notebook in the classroom.

(i) Arrange the following stages in proper sequence, Inspiration, Aspiration, Expiration.

(ii) Match the following :

Organs	Forms
Toad	Alveolus
Tadpole	Cold blooded
Lung	naked, moist
Skin	External gill

3. Label the following :



(a) (b) (c)

Example to illustrate concepts/content

Concept/Content	Example
Pulmonary respiration	Toad, Frog, Man, Bird.
Water	Tadpole, Fish, Prawn
gill respiration	Fish, Tadpole, prawn
Amphibia	Toad, Frog, Salamander
Cutatneous respiration	Toad, frog, Earthworm, Leech.

CRITERION REFERENCED TEST

Table of Specification objectives (Domain) Content (Sub-unit)

Objectives / Concept	K	U	A	S	Total No. of Marks / Total No. Items
Definition of respiration	2 (Q.No.1)				1

Objectives / Concept	K	U	A	S	Total No. of Marks / Total No. Items
Types of respiration	2 (Q.No.2)	2 (Q.No.3) 2 (Q.No.4)	3 (Q.No.5) 4 (Q.No.6)		5
Process of respitation				5 (Q.No.7)	20
% of Marks	16%	16%	28%	20%	7

TEST ITESM

(Frame at least bitens. Against each item mention the form of the item & the objective it express)

Knowledge :

1) How do you define respiration? (2)

(2) How many types of respiration is seen in toad? (2)

Understandıng :

(3) Differentiate between aerobic and anaerobic respiration. (2)

(4) Compare between pulmonary respiration in toad and respiration in man. (2)

Application :

(5) Analyse the condition when toad is kept in air tight condition. (3)

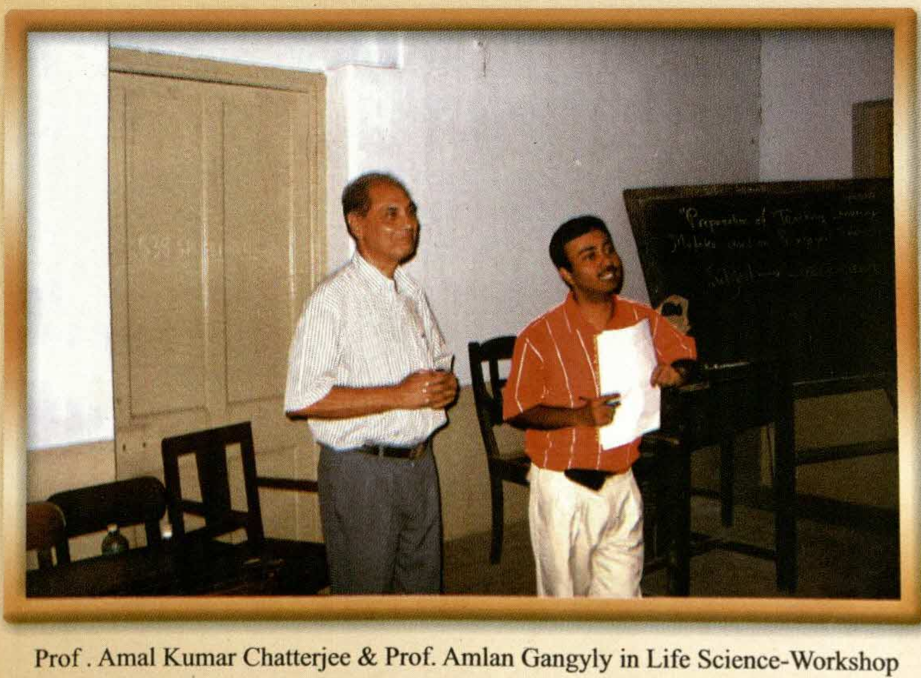
(6) Predict the condition when a match stick is lighted inside a mouth of toad and kept apart. (4)

Skill :

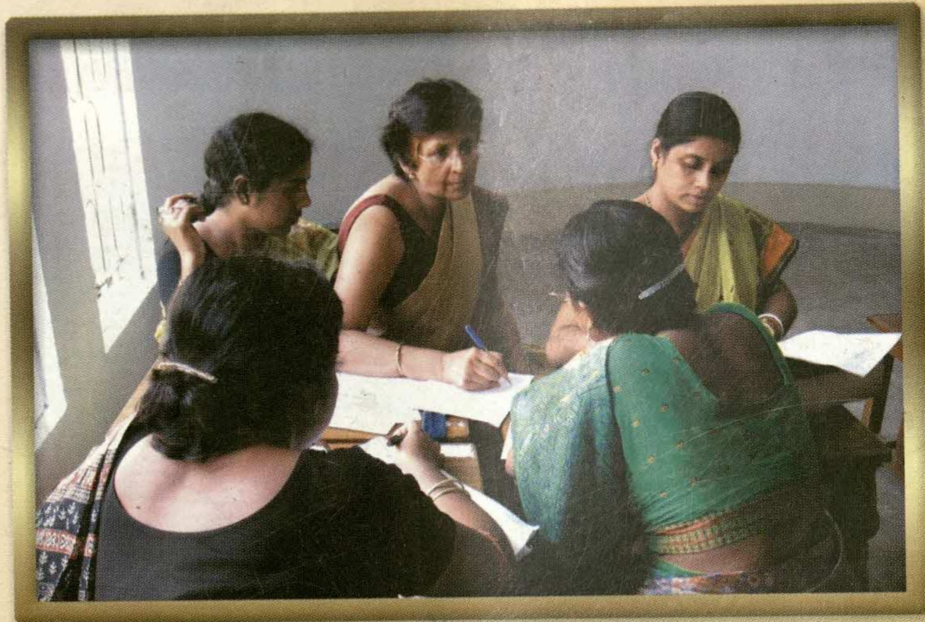
(7) Draw a neat diagram of pulmonary respiration in toad. (5)



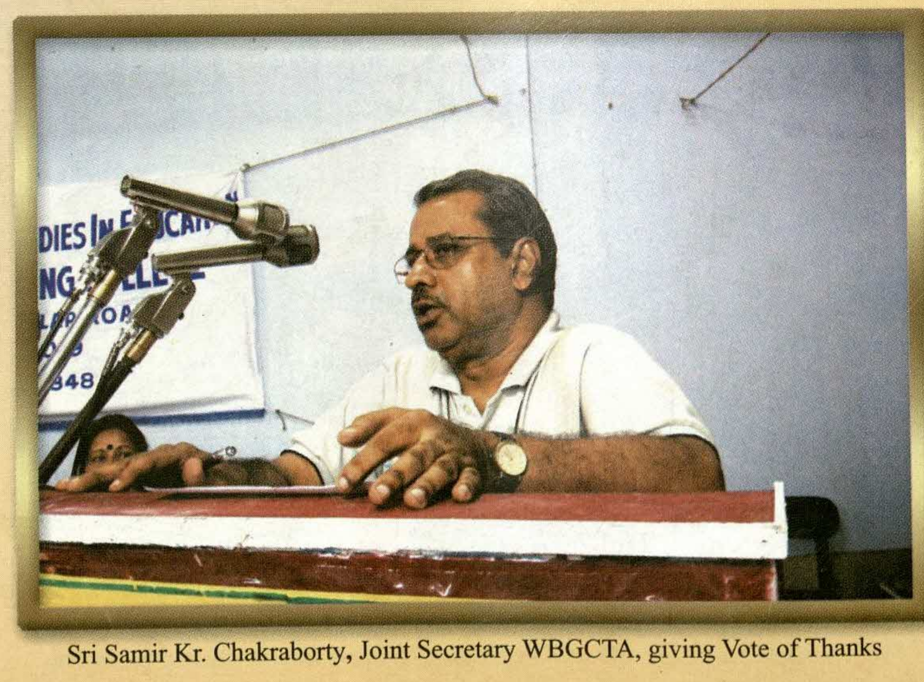
A glimpse of the Physical Science Workshop



Prof . Amal Kumar Chatterjee & Prof. Amlan Gangyly in Life Science-Workshop



Dr. Aditi Ghosh with the Participants in Mathametics-Workshop



Sri Samir Kr. Chakraborty, Joint Secretary WBGCTA, giving Vote of Thanks

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